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TRAVEL IN THE BART SERVICE AREA





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DOCUMENT NO. WP 35-3-77

CONTRACT NOS. DOT-OS-30176
CA-09-0025
CA-09-0042

BART IMPACT PROGRAM
TRAVEL IN THE BART SERVICE AREA



SEPTEMBER 1977

WORKING PAPER

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PREPARED FOR
U.S. DEPARTMENT OF TRANSPORTATION
AND
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C.

The preparation of this report has been financed in part through a grant from the U.S. Department of Transportation, Urban Mass Transportation Administration, under The Urban Mass Transportation Act of 1974, as amended.

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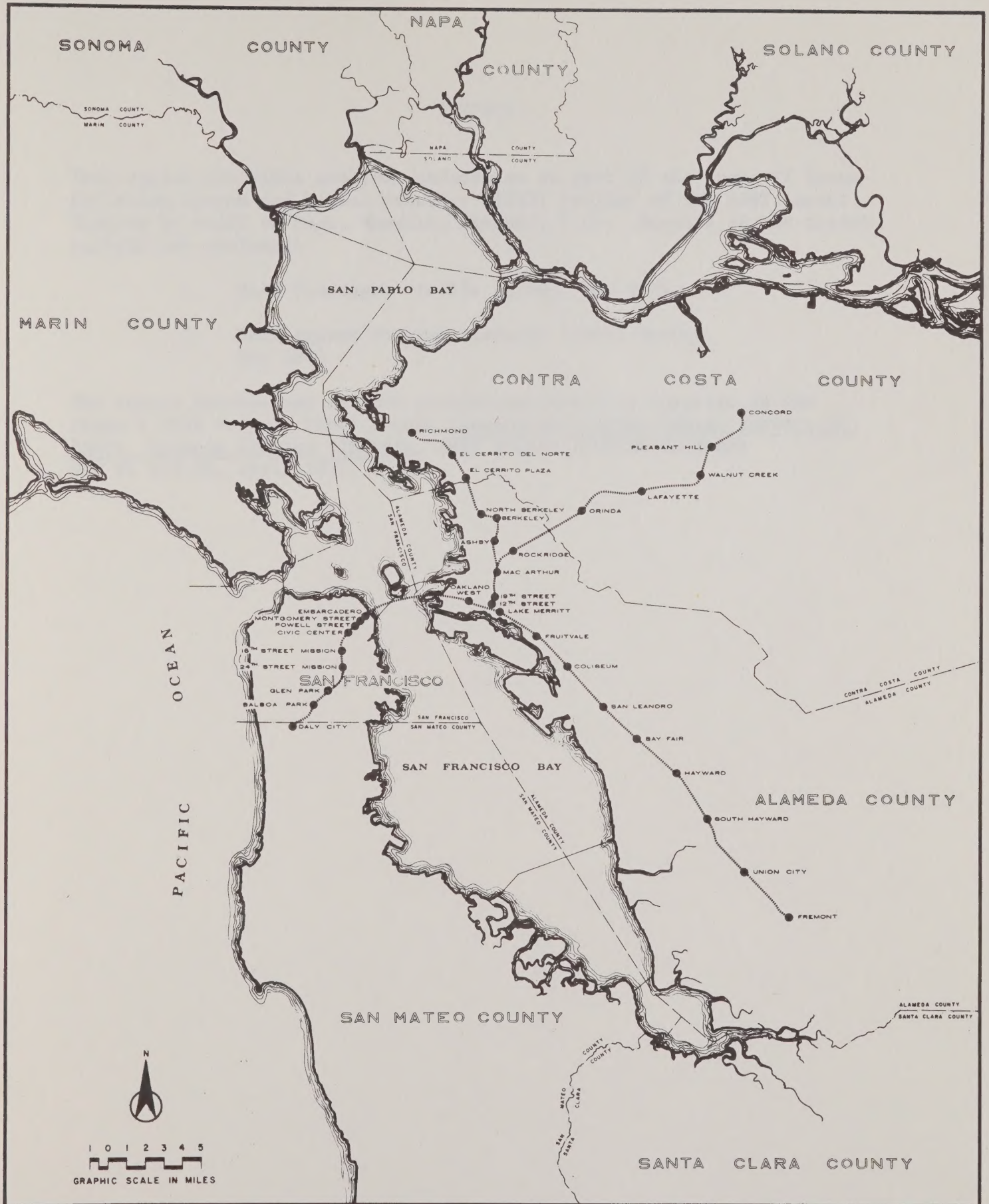
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BART Impact Program
Transportation System and Travel Behavior Project

Travel in the BART Service Area
Prepared by
Peat, Marwick, Mitchell & Co.

September 1977

1. Report No. WP 35-3-77	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Travel in the BART Service Area		5. Report Date September 1977	
		6. Performing Organization Code	
7. Author(s) Steven A. Etkin, Alistair Sherret		8. Performing Organization Report No. WP 35-3-77	
9. Performing Organization Name and Address Peat, Marwick, Mitchell & Co., P. O. Box 8007, Airport Station, San Francisco, California 94128 The Metropolitan Transportation Commission, Hotel Claremont, Berkeley, California 94705		10. Work Unit No. Task Order 3	
		11. Contract or Grant No. DOT-OS-30176	
		13. Type of Report and Period Covered Working Paper	
12. Sponsoring Agency Name and Address U. S. Department of Transportation and U.S. Department of Housing and Urban Development Washington, D.C.		14. Sponsoring Agency Code	
15. Supplementary Notes The Metropolitan Transportation Commission is the prime contractor for the BART Impact Program. Peat, Marwick, Mitchell & Co. is the subcontractor responsible for the Transportation System and Travel Behavior Project.			
16. Abstract BART, the 71-mile Bay Area Rapid Transit System, serving San Francisco, Oakland, Berkeley, and their suburbs, is the first regional-scale rapid transit system to open in the United States in over 50 years. This report is one of a series assessing the impacts of BART on transportation and travel in the Bay Area. The report analyzes the results of two travel surveys: (1) the May 1976 BART Passenger Profile Survey, an on-route self-completion questionnaire survey of 8,000 BART riders, and (2) the BART Impact Program May 1975 Areawide Travel Survey, a telephone interview survey of 1,000 individuals in the BART service area. The report presents information on the socioeconomic characteristics of BART, bus, and automobile travelers, the purposes and other characteristics of their trips, and the shares of areawide travel carried by the modes. BART's ridership is heavily oriented towards peak-period journeys to and from work-places in central San Francisco and Oakland. Two-thirds of all BART trips are between home and work. The 588,000 BART trips made Monday through Friday for all purposes in May 1975 represent a 2.4% share of all areawide trips. But BART's share of areawide trips between home and work is much higher; the 381,000 weekly BART work trips represent a 5.2% share of all weekly work trips. BART's trip market share is highest for very long trips. Of all work trips taking more than 55 minutes, BART carries 38.3%.			
17. Key Words Bay Area Rapid Transit, BART Impact Program, rail rapid transit ridership characteristics, urban travel survey analysis		18. Distribution Statement Document is available to the public through National Technical Information Service, Springfield, Virginia 22151	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 82	22. Price



BAY AREA RAPID TRANSIT SYSTEM

PEAT, MARWICK, MITCHELL & CO.
SAN FRANCISCO

PREFACE

This report describes analyses undertaken as part of the Phase II Transportation System and Travel Behavior (TSTB) Project of the BART Impact Program by staff of Peat, Marwick, Mitchell & Co. Results of two travel surveys are analyzed:

1. BART Passenger Profile Survey, May 1976
2. BART Impact Program Area-wide Travel Survey,
May 1975

The report updates and extends preliminary analyses reported in the Phase I TSTB Project Final Report Transportation and Travel Impacts of BART: Interim Service Findings, BART Impact Program Document No. FR 6-3-75, April 1976.

SUMMARY

Scope of Report

BART, the 71-mile, 34-station San Francisco Bay Area Rapid Transit System, was opened in stages from September 1972 to September 1974, the last stage being the underwater transbay tube linking the downtowns of San Francisco and Oakland. Presently, BART serves about 135,000 one-way trips each weekday from 6:00 a.m. to midnight. This report (1) provides information about the socioeconomic characteristics of BART riders and about the kinds of trips being made by them; (2) describes the socioeconomic characteristics of all travelers in the BART service area, and the number, modes, and characteristics of trips made by them; and (3) establishes the shares of area-wide trips being made by BART, bus, and automobile. The report analyzes the results of two surveys of travel in the BART service area.

Surveys Analyzed

The May 1976 BART Passenger Profile Survey determined the characteristics of BART riders, and the purposes and other characteristics of their trips. It was based on a self-completion questionnaire handed out on BART station platforms to a representative sample of travelers over high school age. Over 8,000 questionnaires were returned and analyzed using weighting factors to account for differences in sampling and response rates by station and time of day. The data were also weighted to account for differential response rates by ethnic/racial category.

The May 1975 BART Impact Program Areawide Travel Survey was a telephone interview survey designed to provide data on respondents' perceptions and knowledge of BART, and their travel habits. The questionnaire included a series of questions designed to obtain a detailed "diary" of all trips made by the respondent on the day before the telephone interview. The survey sample was selected by random-digit dialing of telephones in a BART service area defined as the three BART District counties of San Francisco, Alameda, and Contra Costa, and the northern portion of San Mateo County. One thousand interviews with a representative sample of individuals aged 16 and over were completed. The survey data were analyzed using weighting factors to account for sampling and nonresponse biases.

Socioeconomic Characteristics of BART Travelers

Comparison of the socioeconomic characteristics of BART riders with corresponding census characteristics for the population of the BART service area as a whole suggests that BART travelers contain a slightly higher percentage of males, and are younger. Overall, the census and BART rider distributions of family income are similar. BART ridership has about the same percentage of blacks as are present in the total adult population but a smaller percentage of Spanish-Americans. For travel within the West Bay, 26% of BART's ridership is nonwhite, compared with 16% for East Bay BART travel and 13% for transbay BART travel.

Characteristics of BART Trips

BART's ridership is heavily oriented towards peak-period journeys to and from workplaces in the central business districts of San Francisco and Oakland. About 68% of BART trips are made in the morning and evening peak periods; 67% of all-day BART trips are between home and work. Trips to or from school or college make up a further 11%. The average BART trip takes 46 minutes door-to-door, of which 33 minutes are spent on BART. Transbay trips average 54 minutes door-to-door, East Bay trips 46 minutes, and West Bay trips 34 minutes.

The 1976 Passenger Profile Survey estimates that, of trips made before BART was in operation, 43% were previously made by bus or streetcar and 57% by automobile or other modes. About 26% of East Bay trips previously used bus, 43% of transbay trips previously used bus, and 64% of West Bay trips used bus or streetcar before BART. Of trips not made before BART, 9% were not made because the traveler previously lacked a means of transportation. This percentage may be taken as an estimate of induced trips on the System.

BART's Share of Trips

An estimated total of 24.7 million person-trips are made for all purposes in vehicles Monday through Friday throughout the BART service area. Of these, 588,000 are made on BART, representing a 2.4% share. Bus (or streetcar) trips account for another 10.6%, and the remaining 87.0% are by automobile (or truck). If total weekday trips in the BART service area are stratified by trip purpose, BART's largest share is for trips to and from work (5.2% of all work trips compared with 17.7% by bus and 77.1% by automobile). BART's second largest share is 2.9% of school and college trips, followed by 1.9% of business trips. BART carries negligible shares of shopping and other-purpose trips.

As trip travel times increase, so does BART's share of total areawide travel. For trips under 16 minutes, BART carries a negligible 0.2%; for trips between 16 and 55 minutes BART's share is 3.8%; and for very long trips (more than 55 minutes) BART's share is 14.8%. Considering only journey-to-work trips, BART's share of very long trips is even more pronounced; of all work trips taking more than 55 minutes, BART carries 38.3%.

Potential BART Trips

The above BART "trip market" shares are based on the total number of trips made throughout the May 1975 Areawide Travel Survey sampling area. However, this area includes many parts to which BART effectively provides very little service. To define potential BART trips, i.e., trips which the System could reasonably serve, respondents to the areawide survey were asked whether or not they could have used BART for trips reported. If the respondent answered "yes," the trip was counted as a potential BART trip. Survey results suggest that 11.2% of all weekday trips are or can be made on BART. This represents a potential market of 2.8 million trips per week in total. BART carries 21.3% of this total potential travel market. This estimate compares with the 2.4% estimate for BART's share of all areawide trips.

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I. INTRODUCTION

Objectives

The objectives of the report are to:

- Provide a comprehensive picture of BART ridership in terms of the socioeconomic characteristics of BART riders and the kinds of trips being made by them
- Describe the socioeconomic characteristics of all travelers in the BART service area, and the number, modes, and characteristics of trips made by them
- Establish the shares of total areawide trips being made by BART, bus, automobile, and other modes
- Summarize the attitudes of the areawide population towards BART, and document how these attitudes have changed

Report Outline

Chapter II outlines the surveys and other sources of data analyzed in the report.

Chapter III describes the area served by the BART System, the characteristics of the System, and the service provided by the rest of the transportation system.

Chapter IV describes the socioeconomic characteristics of travelers using the BART System.

Chapter V describes the characteristics of trips made on BART.

Chapter VI compares the socioeconomic characteristics of areawide travelers using BART, bus, and automobile modes.

Chapter VII gives various stratifications of trip types within the areawide total and the distributions of these trips among BART, bus, automobile, and other modes.

Chapter VIII analyzes BART's share of weekday work trips, again for various stratifications of the data.

Chapter IX assesses BART's share of its potential trip market as determined by respondents' perceptions of whether they could use BART for trips.

Chapter X summarizes travelers' perceptions of and satisfaction with BART according to trip purpose and mode used and presents the reasons why some travelers have reduced their use of BART.

II. DESCRIPTION OF SURVEYS ANALYZED

The two principal surveys analyzed in this report are:

1. BART Passenger Profile Survey, May 1976
2. BART Impact Program Areawide Travel Survey, May 1975

BART Passenger Profile Survey, 1976

The 1976 BART Passenger Profile Survey (PPS) is the fourth in a series of annual on-route surveys of BART riders conducted for the Bay Area Rapid Transit District (BARTD) and the Metropolitan Transportation Commission (MTC) to determine the characteristics of BART riders, trip purposes, and other characteristics of trips being made on the System.*

Survey Method. The survey was conducted during two periods: daytime and evening. The daytime survey started at 6:00 a.m. and finished at 3:00 p.m., capturing morning peak ridership and most of the daytime off-peak ridership. The evening survey was conducted from 7:00 p.m. to midnight, capturing evening off-peak ridership. The analyses in this report deal only with the daytime survey. This is because BART's ridership in the evening is relatively small, so that only a limited PPS sample is available, and because the evening survey was not as effectively controlled.

Self-completion survey questionnaires were handed out on BART station platforms. To provide a random sample of BART riders, questionnaires were distributed to every Nth person who met certain eligibility criteria (over high school age, not a BART employee). A tally-sheet record of the questionnaire number, destination station, approximate age, sex, and race was made for every person at the time they were given the questionnaire.

The sampling rate (questionnaires distributed divided by eligible passengers) averaged 16% for the daytime survey or 334 questionnaires handed out per station. (All 33 stations were sampled. The Embarcadero Station was not open at the time of the survey.) The response rate (questionnaires returned divided by questionnaires distributed) averaged 74%. In total 8,142 questionnaires were returned, 247 per station on average.

*An MTC report is available that fully describes how the survey was planned and conducted, and how the data were processed: "1976 BART Passenger Profile Survey: Field Methods and Processing Procedures," Data Document, Metropolitan Transportation Commission, September 1976.

Weighting Factors. Questionnaire distribution procedures were designed and implemented to provide a random sample of all travelers using BART. However, the returned questionnaires available for analysis may not be a random sample of all travelers because of errors arising from a combination of sampling and nonresponse biases. Using information from BART faregate counts and the tally-sheet records of questionnaire handouts, weighting factors were developed which attempt to compensate for biases arising from:

1. Differences in sampling rates by station and time of day
2. Differences in response rates by station and time of day
3. Differences in response rates by ethnic category and time of day

Weighting factors intended to compensate for biases arising from 1 and 2 are documented in the 1976 Passenger Profile Survey data document referenced earlier.

Biases arising from 3 above may be compensated for by the set of weighting factors described in Appendix A. The effect of this weighting scheme is to increase the representation of ethnic groups with relatively low response rates and decrease the representation of ethnic groups with relatively high response rates. The weighting scheme assumes that travelers of a given ethnic group who did not respond have the same distribution of characteristics as travelers of the same ethnic group who did respond.

All analyses of the 1976 Passenger Profile Survey given in this report are of data weighted to compensate for differences in sampling rates by station and time of day (1), and differences in response rates by ethnic category and time of day (3). Differences in response rates among stations (2) are not accounted for explicitly.

Since BART riders were sampled only during the morning and midday off-peak periods, relatively few people making return BART trips were included in the survey. Moreover, BART riders who said they had already received a questionnaire earlier in the day were not asked to fill in another. Thus, the survey effectively sampled travelers (rather than trips made on the System). But faregate counts (i.e., counts of trips made on the System) were used to factor up the number of survey responses to a representation of total BART trips during the survey period. Strictly, this use of trip counts to factor up the responses of sampled travelers introduces an inconsistency and possible source of bias into the analysis--for example, BART trips made as second or subsequent trips by travelers on the survey day will tend to be underrepresented in the trip total. However, this bias is probably negligible, and the results

for the daytime PPS given in this report (shown in the tables as representing a total of 66,800 trips) can probably be considered a reasonable description of both the population of BART travelers surveyed (aged 16 years and older) and the characteristics of the trips made by them over the 6:00 a.m. to 3:00 p.m. survey period.

The intent of the survey was to sample the first half of daily BART ridership, on the implicit assumption that there is a symmetry in the pattern of use of the System. Indeed, over 90% of the survey responses were from travelers making half of a round trip on BART, so the assumption of symmetry appears valid. However, slightly more than half of BART's ridership was sampled (66,800 trips compared to 124,500 total, or 54%). Consequently, the survey data slightly overrepresent off-peak travel and underrepresent peak-period travel.

In order to account for this distortion, weighting factors were computed to allow the characteristics of BART's all-day (6:00 a.m. to midnight) ridership (124,500 trips) to be estimated from the results of the daytime (6:00 a.m. to 3:00 p.m.) survey (representing 66,800 trips). Derivation of the weighting factors is detailed in Appendix B. In applying these factors to the survey data it is assumed that BART trips made during the afternoon peak (3:00 p.m. to 7:00 p.m.) and the travelers making them have characteristics which are the same as, or the mirror image of, the characteristics of trips made during the morning (6:00 a.m. to 9:00 a.m.) peak; also, it is assumed that trips made during the evening (7:00 p.m. to midnight) have characteristics which are the same as those made off-peak (9:00 a.m. to 3:00 p.m.).

Applying the peak and off-peak weighting factors gives a closer representation of the characteristics of BART's total ridership than is given by the 6:00 a.m. to 3:00 p.m. survey data alone. However, as shown in Chapters IV and V, the differences between the estimated distributions for the 6:00 a.m. to 3:00 p.m. survey period and the 6:00 a.m. to midnight period are small for many variables. This is particularly true for the socioeconomic characteristics of BART travelers.

Thus, the survey sample (representing 66,800 trips between 6:00 a.m. and 3:00 p.m.) probably gives a good representation of BART's total ridership for most variables and is used in constructing most of the tables in Chapters IV and V. Where an appreciable bias is introduced by the overrepresentation of off-peak travel (principally in the descriptions of trip characteristics), the peak and off-peak weighting factors are used in constructing the tables to give a better representation of BART's total all-day ridership (124,500 trips between 6:00 a.m. and midnight).

BART Impact Program Areawide Travel Survey, 1975

The survey analyzed in the report to estimate the characteristics of areawide travel is a telephone interview survey conducted in May 1975.* The sample was selected by random-digit dialing of telephones in a BART service area defined as the three BART District counties of San Francisco, Alameda, and Contra Costa, and the northern portion of San Mateo County.**

The survey sought information on respondents' perceptions and knowledge of BART and their travel habits including the modes they use for various trip purposes and places they frequently visit. The questionnaire includes a series of questions designed to obtain a detailed "diary" of all trips made by the respondent on the day before the telephone interview, covering the time at which each trip began, the time the trip took, the number of people traveling with the respondent, the mode used, the trip purpose, and whether or not the trip was home-based. BART riders were asked the BART stations they used, how they got to and from the stations, and how, if at all, they would have made the trip if BART were unavailable. Respondents who did not use BART were asked whether they could have taken BART, and if so the stations and access modes they would have used.

The survey was originally designed to provide:

- Data on travel attitudes and behavior in the BART service area as a context for assessing BART's ridership and share of travel.
- Data which can be directly compared with data from the similar 1971 and 1973 "Attitude and Awareness" surveys (discussed in the following section) in a "time-series" analysis of changes in traveler behavior and perception of and satisfaction with BART.

Satisfying the requirements of the first data set necessitates using a random sample of all individuals (i.e., travelers or potential travelers) in the BART service area. But the second data set requires a household sample, since the 1971 and 1973 surveys sample households in the three-county area (interviewing the first adult who answered the telephone). To meet both objectives, the 1975 survey drew two samples: (1) individuals (aged 16 and over) randomly drawn from the households contacted

*The survey, conducted by the BART Impact Program TSTB Project, is fully described and evaluated in a separate BART Impact Program report: "May 1975 Areawide Travel Survey: Documentation and Evaluation of Procedures," Data Document prepared by Peat, Marwick, Mitchell & Co. for the Metropolitan Transportation Commission, October 1976.

**The San Mateo County portion of the service area is made up of the cities of South San Francisco, San Bruno, Brisbane, Colma, Daly City, Pacifica, and Millbrae.

and (2) people (aged between 18 and 65) who first answered the telephone. These two samples are referred to as the "traveler" and "household" samples, respectively.

Actually, all respondents (i.e., people interviewed) were selected in a way which qualified them for inclusion in the traveler sample. If an individual who qualified for the traveler sample also happened to be the person who answered the telephone and was aged between 18 and 65, then he or she also qualified for the household sample. Thus, the household sample was a subset of the traveler sample; of the total traveler sample of 1,002 respondents eventually included in the survey, 682 were also included in the household sample (a 68% overlap).

The two samples were compared according to age, annual family income, race, sex, education level, travel behavior characteristics, purpose of trip, and mode used for trip.* The two samples are very similar in socioeconomic characteristics except for a higher proportion of females in the household sample than in the traveler sample. The travel behavior characteristics of the two samples are also similar. (Statistically, it is not possible to reject the hypothesis that the two samples were drawn randomly from the same population at a 95% confidence level, except for the distribution of males and females.) For all socioeconomic characteristics (whether the two sample distributions differ significantly or not), the traveler sample distribution more nearly conforms to the distribution given by the 1970 U.S. Census for the survey area population. So the traveler sample appears to be the more representative sample for analyzing areawide travel behavior. Therefore, this report analyzes only the traveler sample.

Also, all analyses are for a sample in which each respondent is weighted according to his or her county of residence, sex, race, age, and family income. The weighting factors were computed so that the resulting aggregate distributions of these characteristics for the weighted traveler sample conform to the 1970 census distributions within each county.** A total (unweighted) sample of 1,002 individuals is analyzed.

The principal shortcoming of the survey is that, in common with similar home-based telephone surveys, there are proportionately fewer workers in the sample than in the total population. This occurs partly as a result of the sampling procedures used to contact respondents (some initial contacts were permitted during daytime hours, when employed

*See "May 1975 Areawide Travel Survey: Documentation and Evaluation of Procedures," pp. 13-15, for details of the traveler and household sample comparisons.

**See "May 1975 Areawide Travel Survey: Documentation and Evaluation of Procedures," pp. 16-18, for comparisons of the (unweighted) traveler sample and census distributions of age, sex, race, and income.

persons are less likely to be at home), partly as a result of the way in which the survey defined workers (as those who made a work trip on the day before the interview), and partly because employed persons are in general less inclined to submit to an interview when they are at home.* Based on analysis of U.S. Census data, trips to and from work on weekdays are estimated to be underrepresented in the survey by about 20% relative to the number of trips made for other purposes. To account for this source of distortion in the survey results, the total number of work trips analyzed in Chapters VI and VII has been adjusted upwards accordingly.

Attitude and Awareness Surveys, 1971 and 1973

Chapter X compares results of the May 1975 areawide survey to two earlier areawide telephone surveys conducted for the BART District in October 1971 and May 1973. These are known respectively as the Phase I and Phase II Attitude and Awareness Surveys.** Both surveys sampled 900 residences, 300 from each of the three BART District counties. (Neither surveyed any part of San Mateo County.) Like the 1975 area-wide survey, the 1971 survey used random-digit dialing to sample households. In the 1973 survey, respondents' telephone numbers were sampled from telephone directory listings.

The surveys represent only individuals aged 18 to 65, and surveyed males and females in equal proportions. Responses to both surveys were weighted in the same way to reflect the actual population distribution among the three counties, with each response being weighted in accordance with the number of people in the household 18 to 65 years old.

The 1971 Attitude and Awareness Survey was conducted before BART began service. The 1973 survey was conducted when service was operating only on the Fremont and Richmond Lines.

*See "May 1975 Areawide Travel Survey: Documentation and Evaluation of Procedures," pp. 19-25, for details.

**The methodology and findings of the two surveys are described in "Attitude and Awareness Study: A Comparative Analysis of Phase I and Phase II," prepared by the BARTD Office of Research, October 1973. All results of the two surveys given here are quoted directly from BARTD's report.

BART Passenger Profile Survey, 1975

In May 1975, at approximately the same time as the 1975 areawide telephone survey, BARTD conducted an on-board survey of BART ridership.* This survey was similar in intent and method to the 1976 PPS described earlier. The principal differences between the two were that (1) the 1975 survey was conducted for the entire day of BART operations (rather than just from 6:00 a.m. to 3:00 p.m. as was the case in 1976), and (2) much more careful controls on sampling and nonresponse rates were used in the 1976 survey than in 1975. As in the 1976 PPS, self-completion questionnaires were distributed to BART riders as they entered stations. Approximately 10,000 returned questionnaires were analyzed. Survey responses to the 1975 PPS were weighted to compensate for biases arising from differential response rates by time of day but not by station or ethnic group.

As the May 1975 areawide survey contains information on only a small sample of BART trips, estimates of the characteristics of BART trips and travelers given in the report are derived from the 1975 or 1976 BART Passenger Profile Surveys. As noted on the individual tables, the 1975 BART survey is used to establish the distribution of basic traveler socioeconomic characteristics (in Table 19) and trip purposes (in Table 20). However, the 1976 BART survey is used to estimate the distribution of BART trip characteristics in other tables of the report. This is because the 1976 survey, by reason of its superior field control and associated weighting scheme, is considered to provide more reliable information on the detailed characteristics of BART trips.

*Survey methodology and findings are reported in "Passenger Profile Study III 1975," prepared by BARTD Department of Planning, Budgeting and Research. All results of the 1975 survey given here are quoted directly from BARTD's report.

III. BART AND THE BART SERVICE AREA

The BART Service Area

As defined by the sampling plan for the May 1975 Areawide Travel Survey, the BART service area comprises the three counties of San Francisco, Alameda, and Contra Costa and the northern part of San Mateo County. Table 1 shows the population, urbanized area, and employment for this area. Table 2 shows socioeconomic characteristics of the service area population as given by the 1970 census. Table 3 gives the census distributions of sex, age, and race for the population aged 16 years or older (i.e., the age group surveyed in both the 1975 areawide and 1976 BART surveys). The income distributions shown in Table 2 were estimated by taking the 1969 distributions given by the census and adjusting them to reflect the change in the average income distribution between 1969 and 1975 for the U.S. as a whole. Details are given in Appendix C.

Contra Costa County. Contra Costa County is a predominantly low-density residential area containing 41% of the urbanized land area, 23% of the population, and 14% of the employment in the BART service area. The County as a whole is the richest (only 19% of the residents had less than a \$10,000 annual family income in 1975), and has the lowest nonwhite population (19%) of the areas shown. Moreover, nearly all the minority and low-income residents live in Richmond and other parts of western Contra Costa County; the more recently developed areas of Walnut Creek and Concord to the east of the Berkeley Hills are predominantly affluent low-density suburbs.

Northern San Mateo County. The part of San Mateo County included in the survey area contains a mix of predominantly white residential areas and industrial areas. The area contains 9% of the survey area resident population (of whom 24% are nonwhite) and 7% of the survey area employment.

City and County of San Francisco. San Francisco is the major employment center with 42% of the jobs (many of these in the downtown business and financial districts), and contains 26% of the population of the BART service area. San Francisco is the most densely populated, although its population has been declining since 1950. The City contains a higher proportion of nonwhites (43%) than the other areas and higher proportion of low-income families (30% had less than a \$10,000 annual income in 1975).

Table 1

DISTRIBUTION OF POPULATION, URBANIZED AREA, AND EMPLOYMENT WITHIN THE BART SERVICE AREA

<u>County</u>	<u>1975 Population</u>	<u>Percent of Total Population</u>	<u>1970 Urbanized Area (square miles)</u>	<u>Percent of Total Urbanized Area</u>	<u>1975 Employment</u>	<u>Percent of Total Employment</u>
Alameda	1,089,900	42.3%	137	41.5%	434,300	36.9%
Contra Costa	582,800	22.7	136	41.2	160,000	13.6
San Francisco	672,700	26.1	32	9.7	495,400	42.1
Northern San Mateo ^a	<u>228,600</u>	<u>8.9</u>	<u>25</u>	<u>7.6</u>	<u>87,700</u>	<u>7.4</u>
Total	2,574,000	100.0%	330	100.0%	1,177,400	100.0%

a. Cities of South San Francisco, San Bruno, Brisbane, Colma, Daly City, Pacifica, and Millbrae.

Sources: Population and employment: Provisional Series 3 Projections, Association of Bay Area Governments, March 1977.

Urbanized area: Series 2 Projections, ABAG/MTC Joint Planning Program, September 1974.

Table 2

SOCIOECONOMIC CHARACTERISTICS OF THE BART SERVICE AREA POPULATION

<u>Socioeconomic Characteristic</u>	<u>County of Residence</u>				<u>Total BART Service Area</u>
	<u>Alameda</u>	<u>Contra Costa</u>	<u>San Francisco</u>	<u>Northern San Mateo^a</u>	
Sex					
Male	49.0%	49.2%	48.3%	49.3%	48.9%
Female	51.0	50.8	51.7	50.7	51.1
	100.0%	100.0%	100.0%	100.0%	100.0%
Age					
Under 16	27.8%	32.0%	19.7%	31.9%	26.8%
16 to 17	3.4	4.2	2.6	3.8	3.4
18 to 24	14.0	10.1	13.6	11.0	12.7
25 to 34	14.1	12.9	15.1	14.9	14.2
35 to 44	11.2	12.7	11.2	13.1	11.7
45 to 54	11.7	13.0	12.1	12.6	12.2
55 to 64	8.6	8.2	11.8	7.6	9.3
65 and over	9.2	6.9	13.9	5.1	9.7
	100.0%	100.0%	100.0%	100.0%	100.0%
Education Level (Population 25 years and older)					
Less than high school	37.0%	32.1%	38.2%	32.1%	36.0%
High school graduate	33.5	33.9	29.4	41.2	32.9
Some college	14.9	16.8	15.7	16.6	15.7
Four or more years of college	14.6	17.2	16.7	10.1	15.4
	100.0%	100.0%	100.0%	100.0%	100.0%
Annual Family Income-- 1975 ^b					
Under \$5,000	9.3%	7.0%	11.3%	5.0%	8.9%
\$5,000 to \$6,999	6.3	4.7	7.6	3.4	6.0
\$7,000 to \$9,999	9.3	7.4	11.1	6.5	9.1
\$10,000 to \$14,999	19.1	16.8	18.5	17.1	18.2
\$15,000 to \$24,999	35.9	38.2	31.0	43.7	35.9
\$25,000 and over	20.1	25.9	20.5	24.3	21.9
	100.0%	100.0%	100.0%	100.0%	100.0%
Ethnic/Racial Category					
White	67.2%	80.7%	57.2%	76.0%	68.1%
Black	15.0	7.4	13.4	2.4	11.8
Spanish-American ^c	12.6	9.3	14.2	16.5	12.7
Other	5.2	2.6	15.2	5.1	7.4
	100.0%	100.0%	100.0%	100.0%	100.0%
Total 1970 Population:	1,073,184	558,389	715,674	217,980	2,565,227

a. Cities of Daly City, Colma, Brisbane, Pacifica, South San Francisco, San Bruno, and Millbrae.

b. 1969 census income distribution adjusted to reflect the change in the total U.S. income distribution from 1969 to 1975 (see Appendix C).

c. This category is comprised of persons of Spanish tongue, all persons in families in which the head or wife reported Spanish as his or her mother tongue, and persons who have a Spanish surname.

Source: 1970 U.S. Census of Population and Housing.

Table 3

SOCIOECONOMIC CHARACTERISTICS OF THE BART SERVICE AREA POPULATION
(Population Aged 16 Years and Older)

<u>Socioeconomic Characteristic</u>	<u>County of Residence</u>				<u>Total BART Service Area</u>
	<u>Alameda</u>	<u>Contra Costa</u>	<u>San Francisco</u>	<u>Northern San Mateo^a</u>	
Sex					
Male	48.3%	48.5%	47.7%	48.7%	48.2%
Female	51.7	51.5	52.3	51.3	51.8
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>
Age					
16 to 17	4.7%	6.1%	3.2%	5.5%	4.6%
18 to 24	19.3	14.9	16.9	16.2	17.4
25 to 34	19.5	19.0	18.8	21.8	19.4
35 to 44	15.5	18.6	13.9	19.3	16.0
45 to 54	16.2	19.2	15.1	18.5	16.6
55 to 64	12.0	12.0	14.7	11.2	12.7
65 and over	12.8	10.2	17.4	7.5	13.3
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>
Ethnic/Racial Category					
White and other	75.1%	85.0%	76.6%	84.6%	78.3%
Black	13.6	6.7	11.1	1.9	10.5
Spanish-American ^b	11.3	8.3	12.3	13.5	11.2
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>
1970 Population					
16 years and older:	774,734	379,792	574,150	148,396	1,877,072

a. Cities of Daly City, Colma, Brisbane, Pacifica, South San Francisco, San Bruno, and Millbrae.

b. This category is comprised of persons of Spanish tongue, all persons in families in which the head or wife reported Spanish as his or her mother tongue, and persons who have a Spanish surname.

Source: 1970 U.S. Census of Population and Housing.

Alameda County. Alameda County contains 42% of the population, 42% of the urbanized area, and 37% of the jobs in the BART service area. Oakland and San Leandro are the major employment centers. In total, the County's population continues to grow, although the populations of the densely populated central cities of Oakland and Berkeley have declined since 1950. In 1970, the County contained a 33% nonwhite population and in 1975, 25% of families had annual incomes below \$10,000; but in the central city of Oakland (which contains about 34% of the Alameda County population) the proportion of nonwhites and low-income families is much higher.

The BART System

A map of the 71-mile, 34-station BART System showing station names and the distribution of the System within the service area counties is given in Figure 1. At the time of the 1975 areawide survey and 1976 Passenger Profile Survey, all but one of the stations (Embarcadero in downtown San Francisco) were open. The System lies within the three Bay Area counties of San Francisco, Alameda, and Contra Costa, except for about 0.2 miles of line and the Daly City BART Station, which are in San Mateo County. Four BART lines radiate from the central Oakland section of the System. These are the Concord, Richmond, Fremont, and Daly City Lines to the east, north, south, and west, respectively.

BART service was introduced in the following stages:

- September 11, 1972--Opening of the Fremont Line
- January 29, 1973--Opening of the Richmond Line
- May 21, 1973--Opening of the Concord Line
- November 5, 1973--Opening of the Daly City Line to San Francisco's central business district (CBD)
- September 16, 1974--Start of transbay BART service
- November 28, 1975--Start of evening service, 8:00 p.m. to midnight

In May 1975, three direct BART services were operating: Fremont-Daly City, Concord-Daly City, and Fremont-Richmond (travelers between stations on the Richmond and Daly City Lines must transfer). The three lines operated from 6:00 a.m. to approximately 8:00 p.m., Monday through Friday, with scheduled headways between trains of about 12 minutes on each of the three services until the end of the evening peak period. Combined headways on the Daly City and Fremont Lines were about 6 minutes

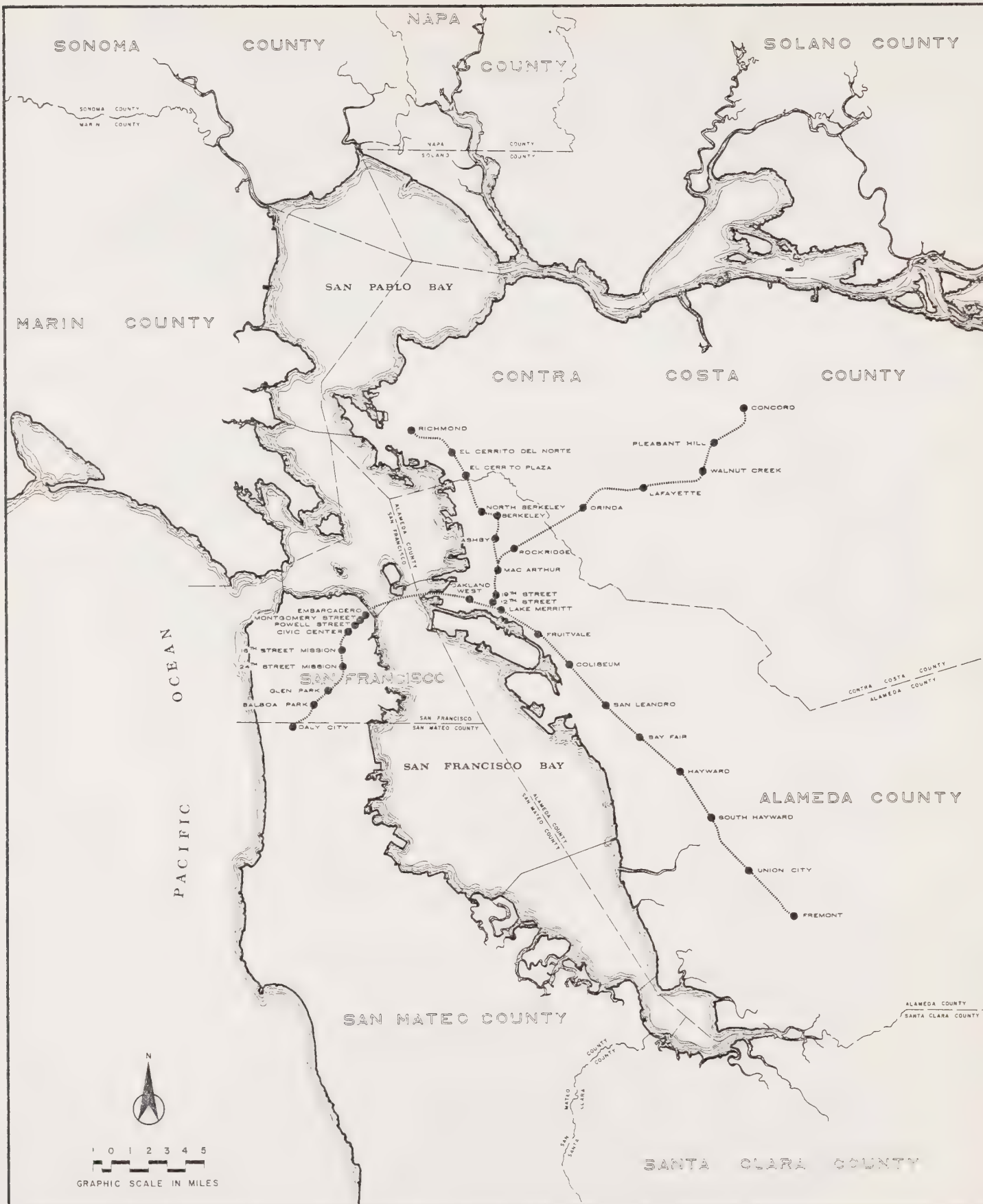


Figure 1

BAY AREA RAPID TRANSIT SYSTEM

during daytime hours of operation (increasing to 10 minutes after the evening peak). No late evening or weekend service was provided at the time of the May 1975 survey. As noted, late evening service was provided by the time of the 1976 PPS; otherwise, service provided at the times of the two surveys was essentially the same.

In May 1975, ridership on BART averaged 117,600 trips per day: 37,600 trips within the East Bay, 27,300 within the West Bay, and 52,600 transbay. In May 1976, ridership averaged 124,500 trips per day.*

The Highway System

As shown in Figure 2, each of the BART lines more or less parallels major freeways. The Daly City Line parallels I-280 and Route 101; the Richmond Line, I-80; the Concord Line, Route 24; and the Fremont Line, Route 17 (and to a lesser extent I-580). Oakland and the other East Bay cities are linked to the San Francisco Peninsula and Marin County by three major highway toll bridges: the San Francisco-Oakland Bay Bridge (generally known as the Bay Bridge), the San Mateo-Hayward Bridge, and the Richmond-San Rafael Bridge. The other major highway links highlighted in Figure 2 are the Golden Gate Bridge, linking Marin County to San Francisco, and the Caldecott Tunnel on Route 24 through the Berkeley Hills, linking central Contra Costa County to Berkeley and Oakland.

The most heavily traveled of these highway links is the San Francisco-Oakland Bay Bridge, which parallels the BART Transbay Tube and connects the freeways of the San Francisco Peninsula and the employment centers of San Francisco directly to Oakland and the freeways leading to the industrial and residential areas of the East Bay. The Bay Bridge carries about 95,000 vehicles per day in each direction.

Other Transit Services

The area served by BART is also served by a number of other transit operators. The most important of these are:

*The BART Department of Planning, Budgeting and Research monthly patronage reports show that May 1976 patronage averaged 136,200 trips per day. However, this figure includes the additional trips gained by the BART System as the result of the San Francisco Municipal Railway (MUNI) strike. The lower ridership figure used here (124,500 daily trips) is used because it more accurately represents typical BART patronage.

Alameda-Contra Costa Transit District (AC Transit). As the major bus operator in the East Bay, AC Transit provides scheduled bus service in the cities west of the Berkeley and San Leandro Hills from Richmond in the north to Fremont in the south, an area of approximately 200 square miles with a population of over one million. In May 1975, all 20 BART stations on the Richmond and Fremont Lines, the Rockridge Station on the Concord Line, and the West Oakland Station on the Daly City Line were in the AC Transit service area. Also, in May 1975, AC Transit was providing "Dial-a-Ride" service in Richmond but this Dial-a-Ride service was discontinued in August 1975. Ridership on these services averaged 146,100 trips per weekday in May 1975. By the time of the May 1976 PPS, AC Transit had added feeder bus services to the Concord, Pleasant Hill, and Orinda Stations, ridership on these services totaling 2,100 trips daily.

In addition to local and express bus service in the East Bay, AC Transit operates extensive bus routes across the San Francisco-Oakland Bay Bridge to the transbay bus terminal on the edge of downtown San Francisco. Ridership on AC Transit's transbay lines in May 1975 averaged 43,800 trips per weekday.

Under contract to the BART District, AC Transit also operates "BART Express Bus" service to and from those portions of the BART District beyond the immediate service area of BART stations. Service on five Express Bus routes began in late 1974: from the Pinole area in northern Contra Costa County to the El Cerrito Del Norte BART Station (Q Line); from Dublin, San Ramon, Danville, and Alamo to the Walnut Creek Station (D Line); from Martinez and Pleasant Hill in central Contra Costa County to the Concord Station (M Line); from Brentwood, Oakley, Antioch, Pittsburg, and West Pittsburg to the Concord Station (P Line); and from Livermore, Pleasanton, Dublin, and San Ramon in Central Alameda County to the Hayward and Bay Fair Stations (U Line). Ridership on these lines totaled 2,400 trips per weekday in May 1975. In May 1976 AC Transit ridership, including BART Express Bus ridership, totaled 199,800 trips per weekday.

San Francisco Municipal Railway (MUNI). MUNI provides bus, trolley, streetcar, and cable car service to the entire City of San Francisco, an area of 46 square miles with a population of slightly under 700,000. MUNI provides bus feeder service to all BART stations in San Francisco. It also serves the Daly City Station in San Mateo County. MUNI's ridership averaged 364,000 trips per weekday in May 1975.

Greyhound Bus Lines. Greyhound commuter buses serve the area east of the Berkeley Hills in central Contra Costa County, which is also served by the BART stations on the Concord Line (except Rockridge). Greyhound commuter service consists mainly of express service between

terminals in Orinda, Lafayette, Walnut Creek, Concord, and downtown San Francisco. Transbay BART service greatly reduced Greyhound ridership on these services. In May 1975, average ridership was 2,900 trips per day; by May 1976, it had dropped to 1,800 trips. Greyhound's Vallejo-San Francisco route runs through Pinole, parallel to BART's Express Bus Q Line. Greyhound also provided bus service between cities in San Mateo County and San Francisco.

Southern Pacific Railroad. Southern Pacific furnishes commuter rail service between San Francisco and cities on the San Francisco Peninsula in San Mateo and Santa Clara Counties. Weekday ridership to or from San Francisco averages about 16,000 trips. In the area of northern San Mateo County included in the 1975 survey, Southern Pacific has stations in South San Francisco, San Bruno, and Millbrae.

Transfer Procedures. Travelers using AC Transit or MUNI to connect with BART pay only half the normal round-trip bus fare, but different transfer procedures apply for the two systems. AC Transit passengers pay the regular bus fare for their trip to the BART station. On their return trip, they can obtain a free transfer ticket in the BART station for a bus ride to any destination within the same fare zone. MUNI passengers can purchase a two-part ticket for the price of one regular ticket (\$0.25) in BART stations. One part of the ticket is valid for the transfer from BART to MUNI, and the second part is valid for a return trip. The ticket bears the name of the BART station where it was issued and is valid for three days.*

*Analyses of BART's impacts on highway traffic volumes and congestion and on bus ridership are given in another TSTB Project report: BART Impacts on Highway Traffic and Transit Ridership, BART Impact Program, Document No. TM 20-3-76, May 1977.

IV. SOCIOECONOMIC CHARACTERISTICS OF BART TRAVELERS

This chapter tabulates socioeconomic characteristics of BART travelers from the 1976 BART Passenger Profile Survey (PPS) according to the following stratifications:

Table 4: Peak and Off-Peak Travel

Table 5: Trip Purpose

Table 6: East Bay, West Bay, and Transbay Travel

Table 7: Previous Mode

Table 8: Origin BART Station

The third column of Table 4 shows the socioeconomic characteristics distribution of BART travelers as computed from data for the total 6:00 a.m. to 3:00 p.m. PPS period (representing 66,800 trips). As discussed in Chapter II, these data slightly underrepresent peak and overrepresent off-peak trips. The fifth column of Table 4 (representing the 124,500 all-day trips) shows the corresponding socioeconomic distributions with compensation made for this bias. Comparison of the third and fifth columns of the table shows negligible differences. Thus, biases attributable to the underrepresentation of peak-period travel appear to be negligible as far as the socioeconomic characteristics of BART travelers are concerned. Consequently, all percentages given in Tables 5, 6, 7, and 8 are based straightforwardly on data for the 6:00 a.m. to 3:00 p.m. survey period (representing a total of 66,800 trips) without further adjustment for peak/off-peak imbalances. In Table 8, the percentages are based on only those travelers making the first leg of a round trip during the survey period. The daily patronage and the base for the percentages for each station can be found in Table 18, Chapter V.

In the following text, the differences commented on are statistically significant at the 95% confidence level unless otherwise stated. The statistical significance of differences between percentages not mentioned in the text may be judged by reference to the table given in Appendix D.

Comparison with Census

The sex, age, education, income, and race of BART travelers may be compared with the distributions of the same characteristics for the population of the BART service area as a whole by comparing the "total all day" BART rider distributions given in Table 4 with the census distributions of sex, age, and race given in Table 3 (for the population aged 16 years and older)

Table 4

SOCIOECONOMIC CHARACTERISTICS OF BART TRAVELERS
ACCORDING TO TIME PERIOD

Socioeconomic Characteristic	Time Period			Total Trips Represented During Survey Period	Total All Day (6:00 p.m. to midnight)	Total All-Day Trips Represented
	Morning Peak Period (6:00 a.m. to 8:59 a.m.)	Off-Peak Period (9:00 a.m. to 3:00 p.m.)	Total Survey Period (6:00 a.m. to 3:00 p.m.)			
Sex						
Male	49.2%	53.9%	51.5%	34,400	50.8%	63,300
Female	50.8	46.1	48.5	32,400	49.2	61,200
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>	<u>100.0%</u>	<u>124,500</u>
Age						
16 to 17	1.7%	3.1%	2.4%	1,600	2.2%	2,700
18 to 24	21.6	28.7	25.0	16,700	24.0	29,900
25 to 34	36.6	30.9	33.8	22,600	34.7	43,100
35 to 54	31.5	22.6	27.2	18,100	28.5	35,400
55 to 64	6.6	7.4	7.0	4,700	6.9	8,600
Over 64	2.0	7.3	4.6	3,100	3.8	4,800
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>	<u>100.0%</u>	<u>124,500</u>
Education Level						
Less than high school	3.3%	6.2%	4.7%	3,200	4.3%	5,400
High school graduate	14.7%	15.6%	15.1%	10,100	15.0	18,700
Some college	39.9	40.0	40.0	26,700	39.9	49,700
4-year college graduate	18.4	15.1	16.8	11,200	17.3	21,500
More than 4 years of college	23.7	23.1	23.4	15,600	23.5	29,200
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>	<u>100.0%</u>	<u>124,500</u>
Annual Family Income						
Under \$7,000	12.4%	27.0%	19.4%	13,000	17.4%	21,600
\$7,000 to \$9,999	12.3	12.7	12.5	8,400	12.4	15,500
\$10,000 to \$14,999	19.2	18.0	18.6	12,400	18.8	23,400
\$15,000 to \$24,999	32.7	25.2	29.1	19,400	30.1	37,500
\$25,000 and over	23.4	17.1	20.4	13,600	21.3	26,500
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>	<u>100.0%</u>	<u>124,500</u>
Ethnic/Racial Category						
White	71.7%	73.5%	72.7%	48,600	72.3%	90,000
Black	11.5	10.9	11.2	7,500	11.3	14,100
Spanish-American	5.5	6.4	5.9	3,900	5.8	7,200
Asian	9.7	7.1	8.4	5,600	8.8	11,000
Other	1.6	2.1	1.8	1,200	1.8	2,200
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>	<u>100.0%</u>	<u>124,500</u>
Unweighted Sample Size:	4,278	3,864	8,142		8,142	
Number of Trips Represented:	34,400	32,400	66,800		124,500	
Percent of Trips Represented:	27.6%	26.0%	53.7%		100.0%	

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 BART Passenger Profile Survey.

and the census distributions of education (for the population aged 25 years and older) and annual family income (for the total population) given in Table 2. Comparison of the BART rider data with the 16-and-over census data (where available) is appropriate because "under high school age" children were not sampled in the PPS.

Relative to the service area population, BART travelers contain a slightly higher percentage of males, are younger, and better educated. However, the latter comparison is complicated by the fact that the census distribution is only for those 25 years and older, while the BART rider distribution is for all those 16 years and older. Overall, the census and BART rider distributions of income are similar.

With regard to race, BART ridership contains about the same percentage of blacks (11.3%) as are present in the adult population in total (10.5%), but BART's ridership contains significantly fewer Spanish-Americans (5.8%) than are present in the census adult population (11.2%). However, the latter comparison may be misleading because of possible ambiguity in the distinction between "white" and "Spanish-American." For example, people who are defined in the census as "Spanish-American" may well have indicated "white" as their race on the travel survey.

Of course, some of the differences between the characteristics of BART riders and the characteristics of the population as given by the census are attributable to the fact that the population of regular tripmakers (by BART and all other modes) is different from the total population. (Older people make fewer trips than younger people, for example.) A comparison of the socioeconomic characteristics of all tripmakers, stratified by mode, is given in Chapter VI.

Peak and Off-Peak Travel

Peak-period trips are defined as those starting (entering BART) between 6:00 a.m. and 9:00 a.m. Off-peak trips are defined as those beginning between 9:00 a.m. and 3:00 p.m. As shown in Table 4, peak-period travelers have a lower percentage of males, have higher family incomes, and are more likely to be in the 25-to-55 age bracket. Minorities are shown as making up a higher proportion of peak than off-peak ridership; however, the difference is not statistically significant at the 95% confidence level.

Trip Purpose

Table 5 compares the socioeconomic characteristics of BART travelers according to trip purpose. The 1976 PPS asked the respondent where he started his trip and where he was going. The following trip purposes were assigned to reported origin/destination pairs.

Assigned Trip Purpose	Reported	
	From	To
Work	Home	Work
Work	Work	Home
Business	Work	Work
School	Home	School
School	School	Home
Personal Business	Home	Shopping, Medical, Personal Business
Personal Business	Shopping, Medical, Personal Business	Home
Other	(All other combinations including recreation trips and trial BART rides)	

As shown in Table 5, 58.8% of all BART trips from 6:00 a.m. to 3:00 p.m. are trips between home and work and another 3.3% are for business reasons. People traveling for work or business reasons are older than people traveling for school, personal business, or other reasons. Business travelers contain a higher proportion of whites and males. They are also more educated and have the highest annual family incomes. A greater percentage of minorities travel to or from school than for any other purpose.

East Bay, West Bay, and Transbay Travel

Table 6 compares the socioeconomic characteristics of BART travelers according to the area of travel. The table shows that transbay travelers are predominantly male, while East Bay and West Bay travelers are predominantly female. The age distributions show only minor differences among the three travel areas. Transbay travelers are more educated than East Bay and West Bay travelers and have higher annual family incomes. Transbay and East Bay travelers have similar ethnic distributions. West Bay ridership contains a considerably higher proportion of minorities.

Table 5

SOCIOECONOMIC CHARACTERISTICS OF BART TRAVELERS
ACCORDING TO TRIP PURPOSE

Socioeconomic Characteristics	Purpose						Total Trips Represented During Survey Period
	Work	Business	School	Personal Business	Other	Total	
Sex							
Male	51.2%	76.8%	53.2%	43.8%	51.3%	51.5%	34,400
Female	48.8	23.2	46.8	56.2	48.7	48.5	32,400
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Age							
16 to 17	0.5%	0.4%	8.1%	3.7%	4.4%	2.4%	1,600
18 to 24	18.8	3.8	60.2	20.8	29.0	25.0	16,700
25 to 34	38.1	44.6	24.7	25.0	28.8	33.8	22,600
35 to 54	33.0	38.8	6.2	23.7	21.2	27.2	18,100
55 to 64	59.0	10.5	0.4	11.3	8.1	7.0	4,700
Over 64	2.6	1.9	0.4	15.5	8.5	4.6	3,100
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Education Level							
Less than high school	3.0%	0.8%	6.7%	10.1%	6.7%	4.7%	3,200
High school graduate	15.1	10.3	8.3	20.3	17.4	15.1	10,100
Some college	37.9	21.3	61.5	35.1	39.6	40.0	26,700
4-year college graduate	18.8	24.9	8.7	15.8	14.1	16.8	11,200
More than 4 years of college	25.2	42.7	14.8	18.7	22.2	23.4	15,600
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Annual Family Income							
Under \$7,000	12.3%	6.8%	39.2%	26.9%	30.0%	19.4%	13,000
\$7,000 to \$9,999	12.5	5.8	13.1	11.8	13.5	12.5	8,400
\$10,000 to \$14,999	19.6	8.6	16.4	20.2	17.5	18.6	12,400
\$15,000 to \$24,999	32.7	36.0	19.5	25.2	23.3	29.1	19,400
\$25,000 and over	22.9	42.8	11.8	15.9	15.7	20.4	13,600
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Ethnic/Racial Category							
White	72.5%	83.1%	62.8%	77.2%	75.1%	72.7%	48,600
Black	11.9	6.4	14.1	8.3	9.9	11.2	7,500
Spanish-American	6.1	3.1	5.7	6.8	5.1	5.9	3,900
Asian	8.2	5.5	14.5	5.6	7.0	8.4	5,600
Other	1.3	1.9	2.9	2.1	2.9	1.8	1,200
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Unweighted Sample Size:	4,805	247	993	944	1,153	8,142	
Number of Trips Represented:	39,300	2,200	8,100	7,400	9,800	66,800	
Percent of Trips Represented:	58.8%	3.3%	12.1%	11.1%	14.7%	100.0%	

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 BART Passenger Profile Survey.

Table 6

SOCIOECONOMIC CHARACTERISTICS OF BART TRAVELERS
ACCORDING TO TRAVEL AREA

Socioeconomic Characteristic	Travel Area				Total Trips Represented During Survey Period
	East Bay	West Bay	Transbay	Total	
Sex					
Male	47.7%	42.6%	58.7%	51.5%	34,400
Female	52.3	57.4	41.3	48.5	32,400
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Age					
16 to 17	3.7%	2.8%	1.0%	2.4%	1,600
18 to 24	31.1	24.1	20.6	25.0	16,700
25 to 34	30.0	36.2	35.6	33.8	22,600
35 to 54	23.4	26.3	30.7	27.2	18,100
55 to 64	6.6	7.4	7.1	7.0	4,700
Over 64	5.2	3.2	5.0	4.6	3,100
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Education Level					
Less than high school	5.9%	6.1%	2.7%	4.7%	3,200
High school graduate	17.3	18.1	11.6	15.1	10,100
Some college	43.6	42.4	35.7	40.0	26,700
4-year college graduate	12.9	15.2	20.9	16.8	11,200
More than 4 years of college	20.2	18.2	29.1	23.4	15,600
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Annual Family Income					
Under \$7,000	25.0%	17.8%	15.8%	19.4%	13,000
\$7,000 to \$9,999	13.3	15.0	10.3	12.5	8,400
\$10,000 to \$14,999	18.1	22.1	17.1	18.6	12,400
\$15,000 to \$24,999	27.8	30.0	29.8	29.1	19,400
\$25,000 and over	15.8	15.1	27.0	20.4	13,600
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Ethnic/Racial Category					
White	73.5%	64.1%	77.0%	72.7%	48,600
Black	12.2	11.9	10.1	11.2	7,500
Spanish-American	5.4	10.2	3.7	5.9	3,900
Asian	6.4	12.2	7.8	8.4	5,600
Other	2.5	1.6	1.4	1.8	1,200
	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>66,800</u>
Unweighted Sample Size:	3,232	1,441	3,469	8,142	
Number of Trips Represented:	21,800	16,900	28,100	66,800	
Percent of Trips Represented:	32.7%	25.3%	42.0%	100.0%	

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 BART Passenger Profile Survey.

Previous Mode

Table 7 presents the socioeconomic characteristics of BART travelers according to the mode used before BART. According to the table, the drive-alone mode was used most frequently by males, while the bus was used most frequently by females. The education level and annual family income distributions show that highly educated BART travelers (college level) or those with high family incomes (\$15,000 and above) relied more on the automobile as a previous mode. A higher percentage of whites drove automobiles or carpooled before BART than used the bus. Conversely, a higher percentage of minorities used bus.

Origin BART Station

Table 8 gives socioeconomic data for BART travelers, stratified by BART station. The data shown are for BART travelers surveyed as they entered a BART station on the first leg of a round trip. Thus most trips are from home so the percentages given in the table approximate the distributions of socioeconomic characteristics for BART travelers resident in each station's catchment area.

Table 7

SOCIOECONOMIC CHARACTERISTICS OF BART TRAVELERS
ACCORDING TO PREVIOUS MODE^a

Socioeconomic Characteristic	Previous Mode					Total	Total Trips Represented
	Bus	Drove Alone	Car Pool	Walk	Other		
Sex							
Male	39.4%	57.1%	40.4%	54.8%	60.6%	46.4%	22,500
Female	60.6	42.9	59.6	45.2	39.4	53.6	26,000
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Age							
16 to 17	2.1%	0.5%	4.5%	8.2%	5.8%	2.1%	1,000
18 to 24	21.1	17.9	26.2	34.1	22.9	21.0	10,200
25 to 34	32.7	36.5	28.7	21.7	41.5	33.4	16,200
35 to 54	29.9	30.8	28.0	19.2	25.3	29.7	14,400
55 to 64	9.0	7.8	7.6	11.4	4.5	8.2	4,000
Over 64	5.2	6.5	5.0	5.4	--	5.6	2,700
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Education Level							
Less than high school	5.2%	2.5%	4.4%	24.8%	7.5%	4.3%	2,100
High school graduate	17.0	11.6	15.9	27.4	13.5	14.9	7,200
Some college	41.5	38.1	40.7	23.5	36.3	39.8	19,300
4-year college graduate	15.8	19.5	18.1	10.4	16.0	17.5	8,500
More than 4 years of college	20.5	28.3	20.9	13.9	26.7	23.5	11,400
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Annual Family Income							
Under \$7,000	20.9%	13.0%	16.2%	47.3%	28.8%	17.5%	8,500
\$7,000 to \$9,999	14.6	9.6	8.3	19.1	20.3	11.7	5,700
\$10,000 to \$14,999	18.8	19.3	17.5	12.9	9.1	18.6	9,000
\$15,000 to \$24,999	27.8	32.7	32.6	14.0	27.4	30.3	14,700
\$25,000 and over	17.9	25.4	25.4	6.7	14.4	21.9	10,600
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Ethnic/Racial Category							
White	65.6%	78.1%	74.6%	64.8%	73.6%	79.1%	34,900
Black	15.2	8.9	8.2	20.7	5.5	11.5	5,600
Spanish-American	7.5	4.3	5.4	7.8	10.8	6.0	2,900
Asian	9.9	7.1	9.6	5.7	2.8	8.7	4,200
Other	1.8	1.6	2.2	1.0	7.3	1.9	900
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Unweighted Sample Size:	2,422	2,297	1,040	70	77	5,906	
Number of Trips Represented:	20,600	18,000	8,700	600	600	48,500	
Percent of Trips Represented:	42.5%	37.1%	17.9%	1.2%	1.3%	100.0%	

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

a. Includes only those travelers who made the same trip before BART.

Source: 1976 BART Passenger Profile Survey.

Table 8

SOCIOECONOMIC CHARACTERISTICS OF BART TRAVELERS
ACCORDING TO ORIGIN STATION^a

Stations	Sex		Age				Education Level					Annual Family Income					Ethnic/Racial Category				
	Male	Female	16 to 17	18 to 34	35 to 64	Over 64	Less Than High School	High School	Some College	4 Years of College	More than 4 Years of College	Under \$7,000	\$7,000 to \$9,999	\$10,000 to \$14,999	\$15,000 to \$24,999	\$25,000 or More	White	Black	Spanish-American	Asian	Other
Concord	57.2%	42.8%	1.1%	58.4%	37.4%	3.1%	2.1%	12.3%	35.7%	22.7%	27.2%	12.8%	8.9%	18.7%	35.8%	23.8%	84.2%	2.6%	5.0%	6.5%	1.7%
Pleasant Hill	60.4	39.6	1.6	46.1	49.7	2.6	2.1	12.6	34.2	21.0	30.1	8.3	6.2	15.2	30.2	40.1	90.0	2.4	2.2	4.2	1.2
Walnut Creek	56.0	44.0	4.3	43.7	42.9	9.1	5.7	10.2	33.0	21.2	29.9	9.0	8.2	15.1	29.4	38.3	92.4	2.0	1.7	3.9	0.0
Lafayette	65.1	34.9	0.4	39.6	55.4	4.6	1.7	8.7	27.7	23.5	38.4	6.4	4.9	12.2	35.9	40.6	94.6	1.4	1.1	2.9	0.0
Orinda	64.9	35.1	2.5	38.6	57.5	1.4	0.8	8.4	24.2	25.2	41.4	6.0	1.5	7.9	24.0	60.6	94.8	0.9	0.3	2.8	1.2
Rockridge	55.8	44.2	0.3	62.9	29.2	7.6	1.3	9.4	28.9	21.3	39.1	20.6	11.4	15.0	25.1	27.9	86.2	5.0	2.6	4.5	1.7
Richmond	41.0	59.0	6.4	61.4	27.5	4.7	9.0	23.3	40.9	10.1	16.7	32.3	15.4	21.5	23.2	7.6	57.3	31.9	7.4	2.9	0.5
El Cerrito del Norte	45.2	54.8	3.1	56.9	36.2	3.8	4.5	19.2	45.5	15.5	15.3	19.4	11.5	16.4	36.0	16.7	77.0	12.2	2.5	7.3	1.0
El Cerrito Plaza	47.2	52.8	3.9	54.6	35.0	6.5	6.0	16.1	37.4	16.1	24.4	22.0	8.5	27.3	25.2	17.0	76.5	7.7	3.1	10.7	2.0
North Berkeley	45.2	54.8	2.4	62.5	28.7	6.4	2.2	7.3	35.0	16.0	39.5	25.1	10.4	20.2	31.5	12.8	70.5	16.9	1.2	9.0	2.4
Berkeley	57.3	42.7	2.7	73.6	20.1	3.6	2.9	10.1	32.2	18.7	36.1	46.5	11.2	15.8	13.1	13.4	83.6	4.4	5.0	6.5	0.5
Ashby	53.2	46.8	1.6	76.4	20.1	1.9	3.1	9.9	48.9	17.3	20.8	41.4	17.5	14.5	20.2	6.4	65.1	23.0	3.7	4.6	3.6
Fremont	53.6	46.4	1.5	55.0	40.3	3.2	4.7	16.5	43.0	16.9	18.9	14.0	8.0	15.9	38.4	23.7	80.3	7.4	3.9	7.1	1.3
Union City	41.2	58.8	1.1	62.3	36.6	0.0	5.2	19.5	40.1	18.0	17.2	11.9	12.2	13.4	42.8	19.7	65.7	6.9	12.5	12.4	2.5
South Hayward	42.8	57.2	2.2	60.9	32.9	4.0	5.2	23.3	42.2	10.9	18.4	16.0	12.7	20.0	38.1	13.2	69.1	7.5	11.2	10.6	1.6
Hayward	47.9	52.1	1.8	56.9	37.0	4.3	6.7	21.3	40.2	12.6	19.2	18.9	11.5	21.8	28.0	19.8	75.9	7.7	10.1	4.3	2.0
Bay Fair	46.7	53.3	1.3	62.9	32.0	3.8	2.3	17.8	54.8	10.0	15.1	13.0	12.5	16.8	37.9	19.8	87.3	2.3	3.6	4.6	2.2
San Leandro	43.2	56.8	0.6	50.6	40.7	8.1	5.0	23.1	47.1	13.7	11.1	17.1	10.2	28.9	29.0	14.8	78.5	4.0	6.1	5.6	5.8
Castroville	45.5	54.5	5.0	67.7	26.8	0.5	8.1	19.4	50.0	8.9	11.6	18.7	25.5	17.1	24.8	13.9	33.8	53.9	5.4	4.4	2.5
Fruitvale	54.3	45.7	4.6	60.8	29.6	5.0	4.2	17.5	40.1	18.7	19.5	18.4	16.0	22.3	17.6	15.7	65.1	20.6	9.3	3.6	1.4
Lake Merritt	47.4	52.6	0.0	71.2	26.4	2.4	1.7	18.1	46.2	8.6	25.4	24.5	16.3	17.7	26.2	15.3	56.0	22.8	3.3	16.7	1.2
MacArthur	53.0	47.0	1.1	61.1	31.7	6.1	4.9	13.9	38.2	18.0	25.0	26.6	16.6	16.3	18.0	22.5	60.9	22.2	2.5	8.8	5.6
19th Street Oakland	52.5	47.5	1.1	55.4	32.9	10.6	4.8	16.2	38.7	14.2	26.1	14.4	20.9	21.2	30.0	13.5	72.9	13.3	2.8	7.2	3.8
12th Street Oakland	59.7	40.3	0.7	70.4	21.3	7.6	5.4	16.9	47.2	15.2	15.3	36.8	9.9	19.7	21.0	12.6	55.3	29.4	2.1	10.0	3.2
Oakland West	61.6	38.4	1.0	61.6	36.5	0.9	2.1	9.0	34.2	24.3	30.4	7.4	13.4	15.6	32.0	31.6	66.1	23.9	2.5	6.4	1.1
Daly City	39.8	60.2	2.5	55.6	37.9	4.0	4.5	19.6	44.0	16.1	15.8	10.0	12.4	24.5	34.3	18.8	64.2	14.0	5.7	14.6	1.5
Bithoa Park	38.9	61.1	2.1	58.7	37.3	1.9	6.0	14.7	50.2	16.8	12.3	16.9	7.7	21.3	36.3	17.8	56.7	18.8	10.6	10.7	3.2
Glen Park	43.8	56.2	1.6	57.5	36.1	4.8	2.4	14.8	42.7	12.0	28.1	10.1	10.8	20.5	39.3	19.3	69.6	8.3	8.9	13.2	0.0
24th Street Mission	49.4	50.6	2.1	69.5	26.2	2.2	7.0	18.1	34.8	21.3	18.8	26.7	21.8	21.8	22.0	7.7	60.8	5.5	26.7	5.4	1.6
16th Street Mission	57.3	42.7	1.4	63.2	34.8	0.6	5.4	18.0	35.7	18.9	22.0	27.0	24.5	21.3	19.1	8.1	68.9	3.4	17.0	7.6	3.1
Civic Center	67.9	32.1	1.5	73.6	23.6	1.3	5.5	12.2	36.9	17.0	28.4	43.3	19.8	13.8	17.3	5.8	63.7	18.6	9.1	8.6	0.0
Powell	56.0	44.0	1.4	63.4	30.2	5.0	3.1	19.1	43.7	15.2	18.9	26.8	17.1	20.2	22.4	13.5	64.6	10.8	5.0	18.2	1.4
Montgomery ^b	67.2	32.8	2.7	42.2	51.5	3.6	3.9	10.6	29.6	24.1	31.8	8.0	4.7	15.7	36.7	34.9	80.8	6.5	0.8	9.1	2.8
Embarcadero																					

a. Data are for BART travelers surveyed entering stations on the first leg of a round trip; i.e., nearly all are trips from home.

b. Embarcadero Station was not open at time of survey.

Source: 1976 BART Passenger Profile Survey.

V. CHARACTERISTICS OF TRIPS USING BART

This chapter tabulates the characteristics of BART trips from the 1976 Passenger Profile Survey (PPS) according to the following stratifications:

Table 9:	Peak and Off-Peak Travel
Table 10:	Trip Purpose
Table 11:	East Bay, West Bay, and Transbay Travel (Estimated 6:00 a.m. to midnight trips)
Table 12:	East Bay, West Bay, and Transbay Travel (6:00 a.m. to 3:00 p.m. survey period trips only)
Table 13:	Previous Mode
Table 14:	Reasons for New BART Trips
Table 15:	Mode Used To Get to BART
Table 16:	Mode Used To Get from BART
Table 17:	Origin BART Station (Purpose, Time, and Frequency of Travel)
Table 18:	Origin BART Station (Access Trip Characteristics)

The third column of Table 9 shows the trip characteristics distribution of BART trips as computed from data for the 6:00 a.m. to 3:00 p.m. period of the PPS (representing 66,800 trips). As discussed in Chapter II, these data slightly underrepresent peak and overrepresent off-peak trips. The fifth column of Table 9 shows the corresponding distributions estimated for the entire 6:00 a.m. to midnight BART service day (representing 124,500 trips), with compensation made for the peak/off-peak bias. Comparison of the third and fifth columns of Table 9 shows significant differences in the trip purpose distributions, with the percentage of work-purpose trips being significantly higher in the total all-day estimate (66.8%) than in the total survey period estimate (58.8%). However, the distribution of other trip characteristics shown in columns three and five is generally close, suggesting that the biases attributable to the underrepresentation of peak-period travel are small as far as these other trip characteristics are concerned. (Travel frequency is the only notable exception.) Consequently, all percentages given in Tables 10, 12, and 13 through 18 are based straightforwardly on data for the 6:00 a.m. to 3:00 p.m. survey period (representing a total of 66,800 trips), without

Table 9

BART TRIP CHARACTERISTICS
ACCORDING TO TIME PERIOD

Trip Characteristic	Time Period			Total Trips Represented During Survey Period	Total All Day (6:00 a.m. to 12:00 midnight)	Total All-Day Trips Represented
	Morning Peak Period (6:00 a.m. to 8:59 a.m.)	Off-Peak Period (9:00 a.m. to 3:00 p.m.)	Total Survey Period (6:00 a.m. to 3:00 p.m.)			
Trip Purpose						
Work	87.0%	27.8%	58.8%	39,300	66.8%	83,100
Business	0.2	6.6	3.3	2,200	2.4	3,000
School	8.9	15.6	12.1	8,100	11.2	13,900
Personal Business	1.3	22.3	11.1	7,400	8.5	10,600
Other	2.6	27.7	14.7	9,800	11.1	13,900
Total	100.0%	100.0%	100.0%	66,800	100.0%	124,500
Travel Area						
East Bay	33.7%	32.7%	33.2%	21,800	33.3%	41,400
West Bay	26.0	24.2	25.1	16,900	24.8	30,900
Transbay	40.3	43.1	41.7	28,100	41.9	52,200
Total	100.0%	100.0%	100.0%	66,800	100.0%	124,500
Total Travel Time						
Under 16 minutes	4.1%	7.4%	5.6%	3,700	5.2%	6,500
16 to 30 minutes	23.3	27.7	25.2	16,800	24.7	30,800
31 to 45 minutes	26.9	21.6	24.5	16,400	25.5	31,700
46 to 60 minutes	28.6	21.4	25.4	17,000	25.7	32,000
Over 60 minutes	17.1	21.9	19.3	12,900	18.9	23,500
Total	100.0%	100.0%	100.0%	66,800	100.0%	124,500
Average in minutes	46.5	45.7	46.2		46.3	
Travel Time on BART						
Under 16 minutes	21.6%	29.6%	25.2%	16,800	24.0%	29,900
16 to 30 minutes	33.5	30.0	31.9	21,300	32.5	40,500
31 to 45 minutes	24.8	18.7	22.1	14,800	23.0	28,600
46 to 60 minutes	14.7	10.9	13.0	8,700	13.5	16,800
Over 60 minutes	5.4	10.8	7.8	5,200	7.0	8,700
Total	100.0%	100.0%	100.0%	66,800	100.0%	124,500
Average in minutes	33.3	33.2	33.2		33.2	
Travel Frequency						
5 days per week	76.2%	32.7%	55.3%	37,000	61.3%	76,400
3 to 4 days per week	12.7	17.7	15.1	10,100	14.4	17,900
1 to 2 days per week	4.7	17.3	10.8	7,200	9.0	11,200
Less than once per week	4.9	24.8	14.4	9,600	11.7	14,600
Trial trip	1.5	7.5	4.4	2,900	3.6	4,400
Total	100.0%	100.0%	100.0%	66,800	100.0%	124,500
Did you make this trip before BART was operating?						
Yes	70.9%	74.4%	72.6%	48,500	72.2%	89,800
No	29.1	25.6	27.4	18,300	27.8	33,700
Total	100.0%	100.0%	100.0%	66,800	100.0%	124,500
Previous Travel Mode						
Bus or streetcar	44.7%	40.1%	42.5%	20,600	43.1%	38,700
Drove alone	36.1	38.1	37.1	18,000	36.8	33,000
Car pool	16.9	18.8	17.9	8,700	17.6	15,800
Walk	0.7	1.9	1.2	600	1.1	1,000
Other	1.6	1.1	1.3	600	1.4	1,300
Total	100.0%	100.0%	100.0%	48,500	100.0%	89,800
Would you make this trip if BART were not operating?						
Yes	98.0%	93.6%	95.9%	64,100	96.5%	120,100
No	2.0	6.4	4.1	2,700	3.5	4,400
Total	100.0%	100.0%	100.0%	66,800	100.0%	124,500
Unweighted Sample Size:	4,268	3,874	8,142		8,142	
Number of Trips Represented:	34,400	32,400	66,800		124,500	
Percent of Trips Represented:	27.6%	26.0%	53.7%		100.0%	

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 BART Passenger Profile Survey.

adjustment for peak/off-peak imbalances. Table 11 gives distributions corresponding to Table 12 but adjusted for the peak/off-peak imbalances (and representing the 124,500 all-day trip total). In Tables 17 and 18, the percentages are based on only those travelers making the first leg of a round trip during the survey period. The daily patronage and the base for the percentages for each station can be found in Table 18.

In the following text, the differences commented on are statistically significant at the 95% confidence level unless otherwise stated. The statistical significance of differences between percentages not mentioned in the text may be judged by reference to the table given in Appendix D.

Peak and Off-Peak Travel

As shown in Table 9, the characteristics of peak-period and off-peak trips are substantially different. The table shows that 87.0% of morning peak-period trips are work trips, while only 27.8% of off-peak trips are between home and work. There are also proportionately fewer very long and very short trips in the peak, although the average travel time in the peak and off-peak is similar (about 46 minutes). Peak trips are made more frequently (76.2% on five days a week or more) than are off-peak trips (32.7%). A higher proportion of peak trips were diverted from bus or streetcar (44.7%) than off-peak trips (40.1%).

Trip Purpose

Table 10 shows characteristics of BART trips according to trip purpose. Among BART school trips, 56.6% are made in the East Bay. Of business trips on BART, 62.7% are made transbay. The total travel time distribution shows that business trips are generally the shortest trips made, while school trips are the longest trips made. People traveling to or from work use BART more frequently than people traveling for any other reason. Personal business trips are the least frequently made trips. More people traveling to or from school did not make the trip before BART than people traveling for any other reason. Work-purpose trips contain the highest percentage (45.0%) of trips previously made by bus or streetcar; business trips contain the highest percentage (58.5%) of trips previously using the drive-alone mode. If BART discontinued service, Table 10 indicates business and other trips would decrease more than work, school, and personal business trips.

East Bay, West Bay, and Transbay Travel

Tables 11 and 12 present the characteristics of BART trips according to travel area. Large differences between the two tables are apparent in the trip-purpose and travel-frequency distributions. As described earlier, Table 12 accounts for the underrepresentation of peak-period trips and, consequently, gives better estimates of the characteristics

Table 10

BART TRIP CHARACTERISTICS
ACCORDING TO TRIP PURPOSE

Trip Characteristic	Trip Purpose						Total Trips Represented During Survey Period
	Work	Business	School	Personal Business	Other	Total	
Time Period							
Morning peak (6:00 a.m. to 9:00 a.m.)	76.9%	3.1%	37.7%	5.8%	9.1%	51.5%	34,400
Midday (9:00 a.m. to 3:00 p.m.)	23.1	96.9	62.3	94.2	90.9	48.5	32,400
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Travel Area							
East Bay	31.2%	13.1%	56.6%	32.0%	27.2%	33.2%	21,800
West Bay	27.7	24.2	18.0	23.8	32.3	25.1	16,900
Transbay	41.1	62.7	25.4	44.2	40.5	41.7	28,100
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Total Travel Time							
Under 16 minutes	4.1%	10.5%	5.7%	8.7%	8.8%	5.6%	3,700
16 to 30 minutes	25.7	42.3	18.8	24.1	26.5	25.2	16,300
31 to 45 minutes	26.9	20.3	21.5	19.3	21.3	24.5	16,400
46 to 60 minutes	27.7	13.3	23.6	24.0	19.4	25.4	17,000
Over 60 minutes	15.6	13.6	30.4	23.9	24.0	19.3	12,900
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Average in minutes	45.4	38.2	51.1	47.1	46.1	46.2	
Travel Time on BART							
Under 16 minutes	23.4%	34.3%	25.7%	27.5%	29.2%	25.2%	16,800
16 to 30 minutes	34.1	35.2	26.6	27.4	29.7	31.9	21,300
31 to 45 minutes	23.9	14.6	21.8	18.0	18.3	22.1	14,800
46 to 60 minutes	13.8	8.0	13.9	13.2	9.0	13.0	8,700
Over 60 minutes	4.8	7.9	12.0	13.9	13.8	7.8	5,200
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Average in minutes	32.3	29.5	35.7	35.7	34.2	35.2	
Travel Frequency							
5 days per week	73.5%	27.4%	57.6%	13.6%	18.3%	55.4%	37,000
3 to 4 days per week	14.1	14.3	24.2	12.2	13.9	15.1	10,100
1 to 2 days per week	5.6	18.1	12.5	23.4	18.8	10.8	7,200
Less than once per week	5.2	35.0	4.7	42.7	33.4	14.4	9,600
Trial trip	1.6	5.2	1.0	8.1	15.6	4.4	2,900
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Did you make this trip before BART was operating?							
Yes	73.2%	76.3%	65.1%	81.6%	68.9%	72.6%	48,500
No	26.8	23.7	34.9	18.4	31.1	27.4	18,300
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Previous Travel Mode							
Bus or streetcar	45.0%	23.6%	40.7%	41.5%	38.1%	42.5%	20,600
Drove alone	37.6	58.5	37.1	34.9	32.1	37.1	18,000
Car pool	15.6	13.9	19.1	20.9	26.1	17.9	8,700
Walk	0.7	2.4	1.1	2.1	2.3	1.2	600
Other	1.1	1.6	2.0	0.6	1.4	1.3	600
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Would you make this trip if BART were not operating?							
Yes	98.0%	91.3%	95.2%	95.0%	90.3%	95.9%	64,100
No	2.0	8.7	4.8	5.0	9.7	4.1	2,700
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Unweighted Sample Size:	4,305	247	993	944	1,153	8,142	
Number of Trips							
Represented:	39,300	2,200	8,100	7,400	9,800	66,300	
Percent of Trips							
Represented:	58.3%	3.3%	12.1%	11.1%	14.7%	100.0%	

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 BART Passenger Profile Survey.

Table 11

BART TRIP CHARACTERISTICS ACCORDING TO TRAVEL AREA
(Total All-Day Trips Represented)

Trip Characteristic	Travel Area				Total All-Day Trips
	East Bay	West Bay	Transbay	Total	Represented
Time Period ^a					
Morning peak (6:00 a.m. to 9:00 a.m.)	27.3%	29.7%	28.3%	28.4%	34,400
Midday (9:00 a.m. to 3:00 p.m.)	26.7	23.9	23.7	24.7	32,400
Afternoon peak (3:00 p.m. to 7:00 p.m.)	38.3	40.7	38.9	39.2	47,600
Evening (7:00 p.m. to midnight)	7.7	5.7	9.1	7.7	10,100
Total	100.0%	100.0%	100.0%	100.0%	124,500
Trip Purpose					
Work	62.9%	72.8%	66.2%	66.8%	83,100
Business	1.0	2.3	3.7	2.4	3,000
School	18.7	7.9	7.1	11.2	13,900
Personal business	8.1	7.3	9.4	8.5	10,600
Other	9.3	9.7	13.6	11.1	13,900
Total	100.0%	100.0%	100.0%	100.0%	124,500
Total Travel Time					
Under 16 minutes	5.0%	7.5%	4.0%	5.2%	6,500
16 to 30 minutes	23.9	49.1	11.8	24.7	30,000
31 to 45 minutes	27.9	29.6	21.4	25.5	31,700
46 to 60 minutes	26.1	9.9	34.1	25.7	32,000
Over 60 minutes	17.1	3.9	28.7	18.9	23,500
Total	100.0%	100.0%	100.0%	100.0%	124,500
Average in minutes	45.8	33.6	53.7	46.3	
Travel Time on BART					
Under 16 minutes	21.7%	48.5%	9.6%	24.0%	29,900
16 to 30 minutes	35.5	42.2	24.5	32.5	40,500
31 to 45 minutes	24.9	6.1	32.0	23.0	28,600
46 to 60 minutes	11.0	1.6	22.9	13.5	16,800
Over 60 minutes	6.9	1.6	11.0	7.0	8,700
Total	100.0%	100.0%	100.0%	100.0%	124,500
Average in minutes	33.0	21.0	41.5	33.2	
Travel Frequency					
5 days per week	60.9%	69.4%	57.2%	61.3%	76,400
3 to 4 days per week	17.6	13.1	12.4	14.4	17,900
1 to 2 days per week	8.9	7.3	10.0	9.0	11,200
Less than once per week	10.2	7.6	15.3	11.7	14,600
Trial trip	2.4	2.6	5.1	3.6	4,400
Total	100.0%	100.0%	100.0%	100.0%	124,500
Did you make this trip before BART was operating?					
Yes	68.1%	79.0%	71.3%	72.2%	89,800
No	31.9	21.0	28.7	27.8	33,700
Total	100.0%	100.0%	100.0%	100.0%	124,500
Previous Travel Mode					
Bus or streetcar	25.9%	63.9%	42.6%	43.1%	38,700
Drove alone	50.9	19.4	37.7	36.8	33,000
Car pool	20.0	13.5	18.4	17.6	15,800
Walk	1.3	2.0	—	1.1	1,000
Other	1.9	1.2	1.3	1.4	1,300
Total	100.0%	100.0%	100.0%	100.0%	89,800
Would you make this trip if BART were not operating?					
Yes	96.4%	95.7%	97.0%	96.5%	120,100
No	3.6	4.3	3.0	3.5	4,400
Total	100.0%	100.0%	100.0%	100.0%	124,500
Unweighted Sample Size:	3,232	1,441	3,469	8,142	
Number of Trips Represented:	41,400	30,900	52,200	124,500	
Percent of Trips Represented:	33.3%	24.8%	41.9%	100.0%	

Note: Due to missing data, actual (weighted) responses calculated from column totals may not sum to the row totals shown.

a. Percentage distributions based on all-day ridership for October 1976. See Appendix B.

Source: 1976 BART Passenger Profile Survey.

Table 12

BART TRIP CHARACTERISTICS ACCORDING TO TRAVEL AREA
(Trips Represented During 6:00 a.m. to 3:00 p.m. Survey Period)

Trip Characteristic	Travel Area				Total Trips Represented
	East Bay	West Bay	Transbay	Total	During Survey Period
Time Period					
Morning peak (6:00 a.m. to 9:00 a.m.)	52.3%	53.3%	49.8%	51.5%	34,400
Midday (9:00 a.m. to 3:00 p.m.)	47.7	46.7	50.1	48.5	32,400
Total	100.0%	100.0%	100.0%	100.0%	66,800
Trip Purpose					
Work	54.3%	63.7%	58.1%	58.8%	39,300
Business	1.3	3.2	5.0	3.3	2,200
School	20.6	8.6	7.4	12.1	8,100
Personal business	11.0	10.3	12.2	11.1	7,400
Other	12.8	13.7	17.3	14.7	9,800
Total	100.0%	100.0%	100.0%	100.0%	66,800
Total Travel Time					
Under 16 minutes	5.4%	12.2%	1.9%	5.6%	3,700
16 to 30 minutes	24.8	47.1	12.6	25.2	16,800
31 to 45 minutes	26.7	26.9	21.4	24.5	16,400
46 to 60 minutes	25.4	9.4	34.8	25.4	17,000
Over 60 minutes	17.7	4.4	29.3	19.3	12,900
Total	100.0%	100.0%	100.0%	100.0%	66,800
Average in minutes	45.7	32.7	54.5	46.2	
Travel Time on BART					
Under 16 minutes	23.9%	51.5%	11.2%	25.2%	16,800
16 to 30 minutes	35.2	39.0	25.5	31.9	21,300
31 to 45 minutes	23.4	5.5	30.4	22.1	14,800
46 to 60 minutes	10.2	1.6	21.7	13.0	8,700
Over 60 minutes	7.3	2.4	11.2	7.8	5,200
Total	100.0%	100.0%	100.0%	100.0%	66,800
Average in minutes	32.5	20.9	40.8	33.2	
Travel Frequency					
5 days per week	55.4%	63.3%	50.6%	55.4%	37,000
3 to 4 days per week	18.4	14.4	12.8	15.1	10,100
1 to 2 days per week	10.9	9.3	11.4	10.8	7,200
Less than once per week	12.4	9.8	18.9	14.4	9,600
Trial trip	2.9	3.2	6.3	4.4	2,900
Total	100.0%	100.0%	100.0%	100.0%	66,800
Did you make this trip before BART was operating?					
Yes	68.7%	79.6%	71.4%	72.6%	48,500
No	31.3	20.4	28.6	27.4	13,300
Total	100.0%	100.0%	100.0%	100.0%	66,800
Previous Mode					
Bus or streetcar	27.0%	64.6%	40.3%	42.5%	20,600
Drove alone	49.1	19.6	39.6	37.1	18,000
Car pool	20.4	12.3	19.3	17.9	8,700
Walk	1.5	2.3	—	1.2	600
Other	2.0	1.2	0.8	1.3	600
Total	100.0%	100.0%	100.0%	100.0%	48,500
Would you make this trip if BART were not operating?					
Yes	95.6%	94.9%	96.7%	95.9%	64,100
No	4.4	5.1	3.3	4.1	2,700
Total	100.0%	100.0%	100.0%	100.0%	66,800
Unweighted Sample Size:	3,232	1,441	3,469	8,142	
Number of Trips					
Represented:	21,800	16,900	28,100	66,800	
Percent of Trips					
Represented:	32.7%	25.3%	42.0%	100.0%	

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 BART Passenger Profile Survey.

of all BART trips. According to Table 11, West Bay trips contain a larger percentage of work-purpose trips than either East Bay or transbay trips. Transbay trips are longest (53.7 minutes average travel time), followed by East Bay trips (45.8 minutes) and West Bay trips (33.6 minutes). People traveling in the West Bay travel more frequently and more were making the same trip before BART than East Bay and transbay travelers. West Bay trips contain the highest percentage of trips previously made by bus or streetcar (63.9%), followed by transbay (42.6%) and East Bay trips (25.9%).

Previous Mode

Table 13 compares BART trip characteristics according to the previous modes of BART travelers. Only the responses of travelers who made the same trip before BART (representing 48,500 trips) are included in the table. Among BART trips previously made by bus, more are made during the morning peak than among those previously made by automobile. BART trips previously made by bus are shorter (40.3 minutes on average) than automobile trips (47.3 minutes).

Reasons for New BART Trips

Table 14 reports the reasons new BART travelers gave for not having previously made the trip. The two predominant reasons are that the traveler moved into the area (33.7%) or the traveler started working in the area (36.1%); 8.9% of the new trips are made by people who previously lacked a means of transportation.

Table 14 suggests that BART provides proportionately greater mobility increases to young (16 to 17) and old (over 65) BART travelers compared with BART travelers in other age groups. This may be inferred from the fact that the percentage of current BART travelers who did not travel previously because they had no previous means of transport is highest for these two age groups. By similar reasoning, BART appears to provide blacks and Spanish-Americans with proportionately greater mobility increases than whites and provides people making personal business and recreational trips proportionately more mobility than people making trips for other purposes.

Access Mode to BART

Table 15 shows the characteristics of BART trips according to the traveler's access mode over the 6:00 a.m. to 3:00 p.m. survey period. Driving alone is the most used access mode during the morning peak period, and walking is the most used means of access during the off-peak period. Correspondingly, driving alone is the predominant access mode for work trips and walking is the prevailing means of access for all other trip purposes. Among BART trips using automobile as the access mode, over half

Table 13

PRESENT BART TRIP CHARACTERISTICS
ACCORDING TO PREVIOUS MODE

Trip Characteristic	Previous Mode						Total Trips Represented During Survey Period ^a
	Bus	Drove Alone	Car Pool	Walk	Other	Total	
Time Period							
Morning peak (6:00 a.m. to 9:00 a.m.)	53.0%	49.0%	47.6%	27.2%	59.5%	51.5%	24,400
Midday (9:00 a.m. to 3:00 p.m.)	47.0	51.0	52.4	72.8	40.5	48.5	24,100
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Trip Purpose							
Work	64.3%	61.2%	52.9%	35.4%	58.0%	59.6%	28,900
Business	2.0	5.7	2.8	7.5	4.6	3.5	1,700
School	10.5	10.9	11.7	10.7	17.7	11.1	5,400
Personal business	11.9	11.4	14.3	21.6	6.2	12.9	6,300
Other	11.3	10.8	18.3	24.8	13.5	12.9	6,300
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Travel Area							
East Bay	20.1%	42.0%	36.6%	42.7%	25.6%	31.6%	15,300
West Bay	41.3	14.4	18.8	57.3	25.3	27.4	13,300
Transbay	38.6	43.6	44.6	--	49.1	41.0	19,900
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Total Travel Time							
Under 16 minutes	9.2%	4.9%	2.6%	28.3%	7.2%	6.6%	3,200
16 to 30 minutes	33.5	22.7	20.8	33.3	21.5	27.0	13,100
31 to 45 minutes	24.3	24.8	22.7	16.7	22.7	24.1	11,700
46 to 60 minutes	21.1	27.7	27.6	8.8	17.8	24.6	11,900
Over 60 minutes	11.9	19.9	26.3	12.9	30.8	17.7	8,600
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Average in minutes	40.3	47.3	50.8	33.5	49.7	44.9	
Travel Time on BART							
Under 16 minutes	36.1%	20.3%	20.0%	62.3%	36.9%	27.7%	13,500
16 to 30 minutes	32.0	33.5	30.6	14.2	20.9	31.9	15,400
31 to 45 minutes	18.0	22.7	24.7	12.7	13.5	20.7	10,000
46 to 60 minutes	10.0	15.0	14.5	3.4	19.1	12.7	6,200
Over 60 minutes	3.9	8.5	10.2	7.4	9.6	7.0	3,400
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Average in minutes	28.2	34.9	36.1	23.9	33.2	32.2	
Would you make this trip if BART were not operating?							
Yes	95.4%	98.1%	95.3%	87.9%	91.1%	96.2%	46,700
No	4.6	1.9	4.7	12.1	8.9	3.8	1,800
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	48,500
Unweighted Sample Size:	2,422	2,297	1,040	70	77	5,906	
Number of Trips Represented:	20,600	18,000	8,700	600	600		48,500
Percent of Trips Represented:	42.5%	37.1%	17.9%	1.2%	1.3%		100.0%

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

a. Includes only the travelers who made the same type of trip before BART.

Source: 1976 Passenger Profile Survey.

Table 14
REASONS FOR NEW BART TRIPS

Traveler and Trip Characteristics	Reasons for New Trips					Total Trips Represented During Survey Period
	Moved into Area	Started Working in Area	No Previous Means of Transportation	Other Reasons	Total	
Sex						
Male	34.8%	33.4%	8.2%	23.6%	100.0%	8,400
Female	32.7%	38.3%	9.6%	19.4%	100.0%	9,900
Total						18,300
Age						
16 to 17	24.6%	23.6%	16.7%	35.1%	100.0%	600
18 to 24	24.4%	38.5%	11.9%	25.2%	100.0%	6,500
25 to 34	41.9%	36.2%	5.7%	16.2%	100.0%	6,500
35 to 54	38.3%	36.6%	4.7%	20.4%	100.0%	3,700
55 to 64	27.9%	35.6%	16.6%	19.9%	100.0%	700
Over 65	32.9%	12.0%	24.9%	30.2%	100.0%	300
Total						18,300
Ethnic/Racial Category						
White	33.8%	36.2%	8.0%	22.0%	100.0%	13,800
Black	36.7%	36.7%	12.9%	13.7%	100.0%	1,800
Spanish-American	25.7%	41.1%	13.8%	19.4%	100.0%	1,000
Asian	35.8%	36.2%	9.6%	18.4%	100.0%	1,400
Other	24.9%	35.2%	2.4%	37.5%	100.0%	300
Total						18,300
Travel Period						
Morning peak (6:00 a.m. to 9:00 a.m.)	40.7%	45.2%	4.8%	9.2%	100.0%	10,400
Midday (9:00 a.m. to 3:00 p.m.)	24.5%	24.2%	14.2%	37.1%	100.0%	7,900
Total						18,300
Travel Area						
East Bay	29.4%	40.3%	9.9%	20.4%	100.0%	7,100
West Bay	42.6%	34.9%	6.5%	16.0%	100.0%	3,400
Transbay	33.8%	32.8%	8.9%	24.5%	100.0%	7,800
Total						18,300
Trip Purpose						
Work	39.9%	51.1%	3.5%	5.5%	100.0%	10,900
Business	9.7%	52.6%	4.0%	33.7%	100.0%	500
School	30.5%	13.5%	14.0%	42.0%	100.0%	2,900
Personal business	31.6%	3.3%	19.6%	45.5%	100.0%	1,200
Recreation	31.6%	3.6%	24.3%	40.5%	100.0%	1,300
Other	9.1%	30.2%	12.8%	47.9%	100.0%	1,500
Total						18,300
Unweighted Sample Size:	722	851	194	469	2,236	
Total Number of Trips Represented:	6,200	6,600	1,600	3,900		18,300
Percent of Total Trips Represented:	33.7%	36.1%	8.9%	21.3%		100.0%

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 BART Passenger Profile Survey.

Table 15

BART TRIP CHARACTERISTICS ACCORDING TO
ACCESS MODE

Trip Characteristic	Access Mode							Total Trips Represented During Survey Period
	Bus	Drive Alone	Car Pool	Walk	Picked Up	Other	Total	
Time Period								
Morning peak (6:00 a.m. to 9:00 a.m.)	45.2%	69.7%	53.1%	33.3%	70.7%	53.4%	51.5%	34,400
Midday (9:00 a.m. to 3:00 p.m.)	54.8	30.3	46.9	66.7	29.3	46.6	48.5	32,400
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Trip Purpose								
Work	50.2%	77.1%	52.8%	44.8%	72.6%	62.6%	58.8%	39,300
Business	1.3	2.1	1.3	7.2	1.4	1.7	3.3	2,200
School	18.0	7.6	3.5	14.3	9.8	15.7	12.1	8,100
Personal business	13.1	7.1	21.2	14.1	5.9	5.9	11.1	7,400
Other	17.4	6.1	21.2	19.6	10.3	14.1	14.7	9,800
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Travel Area								
East Bay	35.7%	35.1%	28.9%	31.6%	32.7%	45.9%	33.2%	21,800
West Bay	27.8	13.7	18.2	33.6	27.1	2.7	25.1	16,900
Transbay	36.5	51.2	52.9	34.8	40.2	51.4	41.7	28,100
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Access Travel Time								
Under 6 minutes	17.0%	33.6%	28.8%	43.8%	49.8%	40.9%	36.5%	24,400
6 to 10 minutes	29.4	36.9	34.9	36.1	32.6	35.6	33.8	22,600
11 to 15 minutes	22.2	16.6	18.9	9.8	10.6	13.6	15.0	10,000
16 to 20 minutes	14.0	6.3	5.6	5.2	4.4	3.5	7.1	4,700
Over 20 minutes	17.4	6.6	11.8	5.1	2.6	6.4	7.6	5,100
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Average in minutes	14.1	10.5	11.3	8.8	8.1	9.2	10.0	
Unweighted Sample Size:	1,523	2,491	480	2,337	1,164	147	8,142	
Number of Trips Represented:	13,400	18,400	3,800	20,200	10,000	1,000		66,800
Percent of Trips Represented:	20.1%	27.6%	5.7%	30.2%	14.9%	1.5%		100.0%

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 Passenger Profile Survey.

are transbay trips. For access times under six minutes, walking is the most frequent means of getting to the BART station, but as access times increase, travelers rely more on buses and driving alone. Access trips by bus are longer (14.1 minutes on average) than access trips by automobile (10.5 minutes) and walking access trips (8.8 minutes).

Egress Mode from BART

Table 16 compares the characteristics of BART trips according to egress mode over the 6:00 a.m. to 3:00 p.m. survey period. During both the morning peak and off-peak periods, walking is the primary means of traveling from a BART station to a destination; 88.4% of these walking egress trips take 10 minutes or less.

Origin BART Station

Tables 17 and 18 summarize BART trip characteristics according to the station of origin. Table 18 shows the high percentage of trips using "drive alone" as the means of getting to certain suburban East Bay stations, such as Lafayette, Orinda, Fremont, Union City, and Bay Fair.

Table 16

BART TRIP CHARACTERISTICS ACCORDING TO
EGRESS MODE

Trip Characteristic	Egress Mode							Total Trips Represented During Survey Period
	Bus	Drive Alone	Car Pool	Walk	Picked Up	Other	Total	
Time Period								
Morning peak (6:00 a.m. to 9:00 a.m.)	38.3%	12.2%	23.2%	60.4%	34.6%	23.5%	51.5%	34,400
Midday (9:00 a.m. to 3:00 p.m.)	61.7	87.8	76.8	39.6	65.4	76.5	48.5	32,400
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Trip Purpose								
Work	41.3%	36.8%	31.2%	67.3%	45.3%	30.2%	58.8%	39,300
Business	1.1	6.9	1.2	3.7	4.4	6.6	3.3	2,200
School	23.4	23.0	6.8	8.4	9.5	19.5	12.1	8,100
Personal business	14.4	20.5	33.6	9.1	12.4	11.8	11.1	7,400
Other	19.8	12.8	27.2	11.5	28.4	31.9	14.7	9,800
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Travel Area								
East Bay	49.7%	33.6%	40.5%	28.2%	41.1%	48.2%	33.2%	21,800
West Bay	13.5	9.8	17.0	29.9	12.7	17.1	25.1	16,900
Transbay	36.8	56.6	42.5	41.9	46.2	34.7	41.7	28,100
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Egress Travel Time								
Under 6 minutes	17.6%	35.0%	39.5%	59.8%	34.1%	23.0%	49.1%	32,800
6 to 10 minutes	26.1	29.3	22.8	28.6	38.3	19.9	28.3	18,900
11 to 15 minutes	23.7	15.2	12.5	7.4	15.4	26.7	11.4	7,600
16 to 20 minutes	14.9	9.3	8.6	2.4	5.3	7.0	5.4	3,600
Over 20 minutes	17.7	11.2	16.6	1.8	6.9	23.4	5.8	3,900
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	66,800
Average in minutes	14.0	11.1	12.0	7.2	9.8	14.5	8.9	
Unweighted Sample Size:	1,669	326	106	5,740	220	81	8,142	
Number of Trips Represented:	13,400	3,100	900	46,800	1,900	700		66,800
Percent of Trips Represented:	20.0%	4.7%	1.4%	70.0%	2.8%	1.1%		100.0%

Note: Due to missing data, actual (weighted) responses calculated from column totals may not exactly sum to the row totals shown.

Source: 1976 Passenger Profile Survey.

Table 17

BART TRIP CHARACTERISTICS ACCORDING TO ORIGIN STATION^a

Stations	Purpose of Travel					Total Travel Time					Frequency of Travel				
	Work	Business	School	Personal Business	Other	Under 15 Minutes	15 to 29 Minutes	30 to 44 Minutes	45 to 59 Minutes	Over 59 Minutes	Every Day	3 to 4 Days per Week	1 to 2 Days per Week	Less than Once per Week	Trials ^b Ride
Concord	79.3%	0.4%	7.2%	7.7%	5.4%	10.2%	2.0%	6.7%	16.1%	65.0%	67.7%	12.6%	4.7%	11.1%	3.9%
Pleasant Hill	85.6	0.0	3.7	5.7	5.0	7.2	0.9	7.4	29.2	55.3	70.6	12.0	5.2	11.5	0.6
Walnut Creek	74.5	1.4	6.6	7.6	9.9	12.0	1.5	9.7	27.4	49.4	59.9	11.8	3.9	19.4	5.0
Lafayette	86.8	0.0	4.8	3.6	4.8	6.0	1.6	20.6	34.8	37.0	66.5	16.2	7.0	8.3	2.0
Orinda	79.7	0.3	8.2	7.0	4.8	5.1	8.8	24.5	37.4	24.2	64.0	17.4	7.9	9.9	0.8
Rockridge	64.3	2.3	6.5	11.5	15.4	9.4	8.3	29.4	25.4	27.5	40.2	19.6	15.3	20.1	4.8
Richmond	55.8	0.5	24.7	8.1	10.9	13.5	8.3	18.5	19.2	40.5	61.7	17.7	8.9	6.0	5.7
El Cerrito del Norte	57.1	0.7	24.7	9.4	8.1	10.4	14.0	31.1	12.9	31.6	59.7	20.2	9.0	7.4	3.7
El Cerrito Plaza	57.0	0.7	20.5	13.8	8.0	17.2	22.0	27.0	12.3	21.5	56.3	21.7	7.7	13.8	0.5
North Berkeley	63.2	1.0	10.0	12.7	13.1	14.0	11.8	20.5	15.5	38.2	49.3	27.3	10.5	10.6	2.3
Berkeley	40.5	1.9	17.6	10.4	29.6	12.3	7.9	26.0	16.9	36.9	38.0	18.0	17.7	23.0	3.3
Ashby	52.5	1.8	23.9	7.2	14.6	16.5	17.1	26.5	11.0	28.9	47.2	23.8	14.9	11.2	2.9
Fremont	63.6	0.0	7.9	10.4	18.1	17.5	0.9	1.9	10.7	69.0	56.2	8.7	9.1	17.6	8.4
Union City	71.8	0.0	10.3	8.5	9.4	13.7	3.7	9.1	19.2	54.3	68.3	12.7	8.4	6.1	4.5
South Hayward	71.1	0.4	9.1	10.5	8.9	11.8	7.4	22.2	24.7	33.9	67.9	13.0	7.4	9.3	2.4
Hayward	62.9	2.4	7.9	10.7	16.0	19.3	3.8	16.9	24.9	35.1	58.8	12.1	9.7	13.1	6.3
Bay Fair	70.6	0.9	7.8	6.6	14.1	11.5	6.5	23.2	26.5	32.3	67.4	7.8	4.1	19.0	1.7
San Leandro	60.3	2.9	12.4	13.3	11.1	15.3	11.2	23.7	23.3	26.5	63.4	12.3	8.7	11.7	3.9
Coliseum	56.7	4.0	14.0	10.2	15.1	19.0	13.2	28.0	22.4	17.4	60.1	14.6	10.1	11.9	3.3
Fruitvale	64.9	0.5	13.6	9.3	11.7	13.9	16.6	27.7	19.5	22.3	54.2	18.5	14.3	9.5	3.5
Lake Merritt	58.9	4.2	11.1	3.5	22.3	21.7	14.0	31.8	14.3	18.2	61.0	14.2	11.7	9.9	3.2
MacArthur	59.5	1.5	8.9	13.7	16.4	11.9	15.3	32.1	18.9	21.8	51.9	14.9	14.4	14.9	3.9
19th Street Oakland	38.1	12.3	7.4	14.8	27.4	16.4	13.1	25.1	18.6	26.8	44.2	15.3	16.6	18.9	5.0
12th Street Oakland	42.7	5.5	9.4	25.0	17.4	23.1	14.6	22.9	9.7	29.7	44.8	22.3	14.5	14.4	4.0
Oakland West	83.6	2.5	3.1	3.1	7.7	6.7	24.6	34.0	19.4	15.3	74.2	13.1	4.4	6.5	1.8
Daly City	82.2	0.5	3.7	5.9	7.7	12.5	8.6	38.7	21.3	18.9	70.0	14.8	5.2	5.9	4.1
Balboa Park	78.1	0.4	4.9	4.6	12.0	9.9	29.0	37.1	14.5	9.5	75.0	10.0	6.3	6.1	2.6
Glen Park	84.1	1.4	3.7	7.1	3.7	13.1	37.0	36.6	4.8	8.5	72.4	15.7	5.4	5.6	0.9
24th Street Mission	59.4	1.3	10.4	16.1	12.8	18.1	36.2	26.4	9.8	9.5	62.3	13.0	11.1	7.5	6.1
16th Street Mission	62.0	1.5	10.5	12.0	13.0	22.6	35.1	18.2	7.4	16.7	58.2	16.4	12.8	8.3	4.3
Civic Center	31.7	4.3	24.1	8.4	31.5	20.2	8.6	20.6	10.8	39.8	45.6	16.6	16.6	14.4	6.8
Powell	25.2	3.0	24.0	16.8	31.0	26.0	10.3	20.6	15.4	27.7	33.3	16.3	15.0	22.0	13.4
Montgomery ^c	39.2	28.8	11.1	2.8	18.1	14.8	19.4	24.6	9.0	32.2	47.4	13.0	16.6	18.6	4.4
Embarcadero															

Note: All data effective May 1976.

a. Data are for BART travelers surveyed entering stations on the first leg of a round trip, i.e., nearly all trips are from home.

b. Travelers who do not actually use BART.

c. Embarcadero Station was not open at time of survey.

Source: 1976 BART Passenger Profile Survey.

Table 18

BART ACCESS TRIP CHARACTERISTICS ACCORDING TO ORIGIN STATION^a

Station	Daily Patronage ^b	Entering First Leg of Trip ^c	Access Mode					Average Access Travel Time (minutes)						Percentage Distribution of Access Travel Time (all modes)						Number Connecting Bus Lines
			Drive Alone	Car Pool	Dropped Off	Bus or Streetcar	Other ^d	Drive Alone	Car Pool	Dropped Off	Bus or Streetcar	Walk	Other ^e	All Modes	Under 6 Minutes	6 to 10 Minutes	11 to 15 Minutes	16 to 20 Minutes	Over 20 Minutes	
Concord	4,547	3,033	44.7%	9.7%	22.6%	10.6%	12.4%	13.9	17.4	9.0	12.3	16.7	6.1	13.1	34.1%	30.3%	18.2%	8.6%	8.8%	3
Pleasant Hill	3,539	1,755	45.4	8.2	22.1	7.1	17.2	9.4	7.9	9.3	11.5	8.8	9.2	9.4	35.7	44.5	13.3	4.9	1.7	3
Walnut Creek	3,661	2,090	46.3	9.4	18.1	10.6	15.6	9.8	11.8	8.6	17.8	9.5	9.5	10.5	30.7	41.4	19.5	3.4	5.0	1
Lafayette	2,112	1,355	53.9	9.7	20.9	0.0	15.5	9.3	9.5	7.4	--	7.7	8.4	8.6	39.7	42.5	14.9	2.5	0.4	0
Orinda	1,869	1,278	59.9	11.1	20.1	0.6	8.3	10.6	9.5	8.2	10.0	12.8	9.6	10.1	29.5	41.8	22.0	4.2	2.5	0
Rockridge	1,997	1,118	36.3	6.2	8.3	22.4	26.8	8.0	14.3	7.8	13.0	9.5	6.4	9.8	41.6	36.3	12.6	6.4	3.2	4
Richmond	1,513	811	27.9	5.3	16.5	24.3	26.0	16.7	20.7	8.1	17.5	12.0	13.4	14.7	36.7	26.8	11.6	9.9	15.0	4
El Cerrito del Norte	1,938	1,358	48.2	10.3	11.1	11.4	19.0	13.6	8.8	6.9	15.4	9.2	5.0	11.7	44.8	25.6	14.9	8.0	6.8	8
El Cerrito Plaza	1,332	1,042	29.5	4.8	9.4	12.7	43.6	6.7	6.0	8.0	12.5	8.7	5.9	8.4	54.8	27.1	12.2	3.1	2.8	6
North Berkeley	1,483	1,013	30.2	2.7	9.2	10.0	47.9	8.1	5.4	5.5	10.5	7.6	4.4	7.6	53.1	32.2	9.5	4.0	1.2	6
Berkeley	5,629	1,603	4.3	0.0	4.5	33.3	57.9	8.8	--	14.9	12.3	10.0	9.8	10.8	43.8	28.5	15.9	7.0	4.8	11
Ashby	1,400	752	20.9	5.1	9.7	12.1	52.2	9.4	9.5	8.8	15.2	7.7	7.9	9.2	55.4	23.0	11.1	5.1	5.4	6
Fremont	3,439	2,019	50.7	12.4	12.3	18.5	6.1	14.0	18.5	12.9	23.9	9.7	6.7	16.0	34.8	20.2	13.6	9.3	22.2	8
Union City	2,367	1,455	56.1	7.6	12.6	15.3	8.4	9.1	12.7	7.7	13.8	11.1	10.7	10.1	32.3	43.4	14.2	6.8	3.3	2
South Hayward	1,950	1,094	45.3	6.5	22.9	7.7	17.6	7.4	11.3	6.0	15.9	12.1	8.7	8.6	57.4	27.4	9.6	0.4	5.1	2
Hayward	3,411	1,604	45.3	6.0	15.6	22.0	20.1	11.1	24.2	8.4	19.9	14.7	4.7	13.6	32.7	34.6	13.4	6.8	12.5	14
Bay Fair	2,685	1,742	50.6	11.4	14.8	14.2	9.0	11.0	15.5	8.6	22.2	11.5	--	12.9	41.4	31.1	8.2	5.2	14.1	8
San Leandro	2,204	1,079	41.6	8.6	16.5	16.5	16.8	7.0	8.5	10.8	13.5	12.5	5.7	9.6	44.9	34.2	12.1	2.8	6.0	8
Coliseum	2,020	880	34.1	3.4	13.8	33.8	14.9	8.6	7.6	8.4	13.9	10.3	6.2	10.4	46.8	28.2	12.2	6.8	6.0	3
Fruitvale	2,902	1,433	42.2	4.4	11.9	27.8	13.7	9.0	6.0	12.4	10.6	9.3	5.0	9.7	43.7	31.9	16.3	4.5	3.7	12
Lake Merritt	3,281	1,078	28.2	5.7	17.9	10.3	37.9	11.2	12.7	12.8	21.5	6.5	6.8	10.8	41.1	34.6	11.9	4.3	8.1	4
MacArthur	2,016	1,033	37.6	5.1	13.1	18.6	25.6	10.6	12.5	11.8	13.2	7.5	5.0	10.5	39.3	35.6	13.1	6.4	5.6	8
19th Street Oakland	5,633	1,244	11.5	4.2	8.2	27.6	48.5	10.4	17.2	19.7	13.9	7.3	--	10.7	47.7	24.6	15.7	4.7	7.2	19
12th Street Oakland	4,632	1,024	7.5	0.9	5.2	56.0	30.4	12.5	--	7.4	12.6	4.9	--	10.8	46.8	27.5	13.5	4.7	7.5	29
Oakland West	1,824	945	59.1	10.7	14.9	4.8	10.5	15.2	16.0	16.2	14.3	7.4	5.0	14.6	29.1	31.6	17.1	5.8	16.3	3
Daly City	8,084	4,615	21.8	6.6	27.3	31.0	13.3	12.2	13.6	9.4	17.6	12.1	--	13.2	24.3	36.8	17.8	13.0	8.0	9
Balboa Park	4,482	2,325	25.3	6.9	23.1	11.5	33.2	12.4	13.1	6.5	9.5	8.7	--	9.5	37.3	42.3	12.5	4.8	3.1	6
Glen Park	3,612	2,654	22.8	4.5	21.5	18.5	32.7	7.6	7.2	6.8	10.1	7.5	--	7.8	53.6	34.2	8.9	3.2	0.0	3
24th Street Mission	3,210	1,533	5.2	2.2	11.8	18.1	62.7	9.7	4.7	10.3	13.3	6.9	5.0	8.6	55.1	29.1	8.7	4.5	2.7	9
16th Street Mission	2,281	1,075	6.8	1.3	10.6	16.4	64.9	7.2	3.0	9.4	12.3	8.3	--	9.3	52.6	31.1	8.8	2.2	5.3	9
Civic Center	7,607	1,433	5.3	0.8	2.8	42.6	48.5	8.6	10.0	13.2	20.0	8.4	15.0	13.7	42.9	24.5	7.2	11.7	13.8	23
Powell	11,031	2,081	3.2	1.0	4.5	48.5	42.8	12.4	41.7	12.8	17.7	11.1	44.0	15.5	38.6	19.8	15.9	11.3	14.3	28
Montgomery f	16,237	1,388	3.9	1.5	5.6	28.0	61.0	11.2	6.5	17.3	20.3	6.3	21.9	11.3	50.8	18.9	13.2	7.4	9.7	41
Embarcadero	9,486																			41

Note: All data effective May 1976 except BART Patronage and Number of Connecting Bus Lines data which are effective February 1977.

- a. Data are for BART travelers surveyed entering stations on the first leg of a round trip; i.e., nearly all trips are from home.
b. The total number of people entering the BART station for a typical day, February 1977.
c. The number of BART travelers entering the BART station from 6:00 a.m. to 3:00 p.m. and from 7:00 p.m. to midnight who were making the first leg of a round trip.
d. "Other" includes bicycle, motorcycle, and walking. Walk trips comprise 25.2% of access trips while bicycle and motorcycle trips comprise 1.6% of access trips.
e. "Other" includes bicycle and motorcycle.
f. The Embarcadero Station was not open at time of survey.

Sources: 1976 BART Passenger Profile Survey.
BARTD Department of Planning and Research.
"BART & Buses"--A map guide of the San Francisco/Daly City area showing BART and connecting bus routes.
"BART & Buses"--A map guide of the East Bay showing BART and connecting bus routes.
Sanfrans bus schedule for Daly City services.

VI. SOCIOECONOMIC CHARACTERISTICS OF AREAWIDE TRAVELERS

The 1975 population of the area covered in the May 1975 Areawide Travel Survey is estimated at 2,574,000 persons. Of these, 1,878,000 are aged 16 years or older. This estimated adult population was taken as the total traveler population for the areawide travel survey and is used as the basis for the data and analyses presented in this report.

According to the May 1975 Areawide Travel Survey, the traveler population in the BART service area makes about 33.4 million trips per week by transit, private automobile, or other vehicles. Some 24.7 million (84%) of these are made on the five weekdays combined and 8.7 million (26%) on Saturday and Sunday. (These figures represent trip-making rates of 2.63 trips per person per day on weekdays and 2.32 trips per person per day on weekends.)

Table 19 compares socioeconomic characteristics of travelers making BART trips with the characteristics of travelers making trips as automobile drivers, automobile passengers, and by bus or streetcar. The table shows total estimated trips made per seven-day week.

BART Travelers Compared to Automobile Travelers

Comparing the characteristics of travelers making BART trips with those making trips as automobile drivers shows a similar distribution between males and females (about 55% male and 45% female). However, according to Table 19, the typical BART traveler is younger, more likely to be nonwhite, and has a higher family income than the typical automobile driver. Among trips made as automobile passengers, a much lower proportion are made by males (25%) than females (75%) compared to either BART or automobile-driver trips. Automobile passengers also tend to be rather older and have lower family incomes than drivers or BART riders.

BART Travelers Compared to Bus Travelers

The survey results presented in Table 19 show a slightly higher proportion of BART trips are made by males than are made by females, while bus trips are made by about equal numbers of males and females. Comparing the age distributions of BART and bus travelers* shows that a higher percentage of BART travelers are in the 25-to-44 age group with correspondingly lower percentages in the under-25 and over-44 groups.

*In the remainder of the discussion it is assumed that the population of travelers and the population of people making trips (which are different to the extent that some people make more trips than others) have similar characteristics. Consequently the terms "traveler" and "trip-maker" are used synonymously.

Table 19

SOCIOECONOMIC CHARACTERISTICS OF PEOPLE MAKING TRIPS ACCORDING TO TRAVEL MODE
(Total Trips Made in Vehicles per Seven-Day Week, May 1975)

<u>Socioeconomic Characteristic</u>	<u>BART</u>	<u>Automobile Driver^a</u>	<u>Automobile Passenger</u>	<u>Bus or Streetcar</u>	<u>Total</u>
Sex					
Male	53.5%	55.4%	24.5%	49.9%	49.8%
Female	46.5	44.6	75.5	50.1	50.2
	100.0%	100.0%	100.0%	100.0%	100.0%
Age					
Under 25	26.8%	22.7%	32.7%	33.4%	32.7%
25 to 44	49.5	43.6	29.1	29.7	49.9
Over 44	23.7	33.7	38.2	36.9	17.4
	100.0%	100.0%	100.0%	100.0%	100.0%
Annual Family Income					
Under \$10,000	29.9%	28.5%	36.1%	57.2%	32.8%
\$10,000 to \$20,000	37.0	50.0	48.3	34.6	47.8
Over \$20,000	33.1	21.5	15.7	8.2	19.4
	100.0%	100.0%	100.0%	100.0%	100.0%
Ethnic/Racial Category ^b					
White	72.2%	87.5%	84.7%	75.2%	85.5%
Black	9.6	7.9	8.0	13.7	8.5
Other	18.2	4.6	7.3	11.1	6.0
	100.0%	100.0%	100.0%	100.0%	100.0%
Number of Trips Represented:	588,000 ^c	23,912,000	5,365,000	3,537,000	33,402,000
Percent of Trips Represented:	1.8%	71.5%	16.1%	10.6%	100.0%
Unweighted Sample Size:	9,698 ^d	1,558 ^e	415 ^e	237 ^e	

a. Includes "other" modes, largely pickup trucks and other commercial vehicles.

b. BART data are weighted to account for differential response rates by ethnic category using weighting factors derived for 1976 Passenger Profile Survey.

c. Average number of weekly BART trips, May 1975.

d. Represents the number of trips made by respondents to the 1975 BART Passenger Profile Survey.

e. Represents the number of trips made by respondents to the 1975 Areawide Travel Survey.

Sources: BART Impact Program, May 1975 Areawide Travel Survey (for automobile and bus trips).
1975 BART Passenger Profile Survey (for BART trips).

According to Table 19, BART trips are typically made by people having considerably higher incomes than those traveling by bus. Relative to bus trips, BART trips are also apparently made by smaller percentages of whites and blacks but by a larger percentage of people in the "other" ethnic category.

VII. BART'S SHARE OF WEEKDAY TRIPS

This section analyzes BART's share of areawide trips made Monday through Friday based on results of the May 1975 Areawide Travel Survey. (BART did not provide regular Saturday and Sunday service during 1975.) BART's share of a number of trip "markets" is considered.

Work Trips Made in the BART Service Area

For the reasons outlined in Chapter II, the areawide telephone survey underrepresents the number of trips made to and from work in the BART service area. To gauge the extent of this underrepresentation, an estimate of the total number of work trips was made from 1970 U.S. Census data and 1975 ABAG Provisional Series 3 population projections as follows: The total 1975 population (aged 16 years and older) of the BART service area is estimated as 1,878,000. Of these, 60% or 1,123,000 are employed, and of these workers 83% or 934,000 usually travel to work by some form of vehicle (automobile, truck, bus, street-car, or train). The remaining 17% of workers usually work at home, walk to work, or use some other mode of transport.

In estimating the number of work trips made by these workers, the following assumptions are made: (1) the typical worker is assumed to work a standard five-day week (i.e., the number of workers working less than five days is offset by the number of those working six or seven days); (2) the typical worker is assumed to go to work by his usual method on 230 days a year (i.e., on 30 of the approximately 260 work days in the year he takes holidays, vacation, and sick leave, works at home, or does not make a work trip for other reasons); (3) on each day he goes to work he makes two work trips. These three assumptions give an estimated 460 work trips per worker per year, or a total of about 429 million work trips per year.

The areawide telephone survey results suggest that 88% of work trips are made on weekdays, giving an estimated total of about 379 million weekday work trips annually. This is equivalent to 1,458,000 work trips per typical weekday, or 7,289,000 per typical Monday-through-Friday period.

The 7,289,000 trip estimate may be compared with the corresponding estimate of 5,891,000 weekly trips derived directly from the areawide telephone survey, suggesting about a 20% underrepresentation of work trips in the telephone survey. To compensate, in the remainder of this report the 7,289,000 work-trip total is used as a control total, with the areawide telephone survey results being used to estimate the distribution of trip characteristics within this total.

BART's Share of Weekday Trips According to Trip Purpose

Table 20 shows total weekday trips in the BART service area, distributed by mode (BART, automobile driver, automobile passenger, and bus or streetcar) and by trip purpose (work, business, school, shopping, and other).

Overall, BART's share of total weekday trips is by far the smallest of the four modes: about 588,000 trips per week or approximately 2.4% of the total 24,680,000 trips made on all modes. About 10.6% of total trips are made on bus or streetcar, and the remaining 87.0% by automobile (and other vehicle modes).

When total weekday trips in the BART service area are stratified by trip purpose, BART's largest share is for trips to and from work (5.2% of all work trips).^{*} Its second largest share is 2.9% of school or college trips, followed by 1.9% of business trips. BART carries a negligible share (less than 1%) of shopping or other-purpose trips.

BART's Share of Weekday Trips According to Trip Start Time

Table 21 shows weekday vehicle trips in the BART service area, distributed by mode and start time, and Table 22 gives trips by purpose and start time. Both tables correlate with data given in Table 20, showing that BART's largest share of travel is for trips made to or from work (in the peak period), and its smallest share is for trips in the shopping and other-purpose categories (in the off-peak).

As shown on Table 21, BART's share of trips varies according to the time the trip starts. BART captures its largest share (5.4%) of total trips during the 7:00 a.m. to 9:00 a.m. period and its second largest share

^{*}Preliminary results of the Census Bureau's 1975 Annual Housing Survey (AHS) Travel to Work Supplement for the three BART District Counties show that an estimated 3.8% of the workers in the three BARTD counties who travel to work by automobile, truck, or public transit usually go to work by BART ("railroad, subway, or elevated"). Given that BART does not operate on weekends, this result is equivalent to the estimate that about 4.3% of weekday work trips are usually made by BART. The difference between this 4.3% estimate and the 5.2% estimate given in Table 20 may be explained by a number of factors including: (1) the preliminary nature of the AHS survey results (data are for about one-third the number of cases in the entire sample, and are not fully edited); (2) possible sampling errors; (3) differences in the way workers and modes were defined in the AHS and areawide telephone surveys; and (4) the slightly different areas covered in the two surveys. Bearing these uncertainties in mind, the 4.3% AHS estimate can probably be regarded as a reasonable verification of the estimate given in Table 20 for the percentage of work trips made by BART.

Table 20

MODE AND PURPOSE OF TRAVEL
(Total Trips Made in Vehicles Monday through Friday, May 1975)

Trip Purpose	Mode of Travel				Total All Modes
	BART	Automobile Driver ^a	Automobile Passenger	Bus or Streetcar	
Work	381,000 5.2%	4,779,000 65.6%	838,000 11.5%	1,291,000 17.7%	7,289,000 100.0%
Business	33,000 1.9%	1,462,000 86.2%	108,000 6.4%	93,000 5.5%	1,696,000 100.0%
School or College	77,000 2.9%	1,798,000 66.2%	325,000 12.3%	494,000 18.6%	2,654,000 100.0%
Shopping	29,000 0.6%	3,788,000 78.5%	777,000 16.1%	230,000 4.8%	4,824,000 100.0%
Other Purposes ^b	68,000 0.8%	5,926,000 72.1%	1,702,000 20.7%	521,000 6.4%	8,217,000 100.0%
Number of Trips Represented	588,000 ^c	17,713,000	3,750,000	2,629,000	24,680,000
Percent of Trips Represented	2.4%	71.8%	15.2%	10.6%	100.0%
Unweighted Sample Size:	9,698	1,183	262	192	

- a. Includes "other" modes, largely pickup trucks and other commercial vehicles.
A total of 834,000 weekday trips per week are made by these modes.
- b. The other-purposes category includes recreation trips, trips to visit friends
or relatives, and personal business trips.
- c. Average number of weekday BART trips, May 1975.

Sources: BART Impact Program May 1975 Areawide Travel Survey.
1975 BART Passenger Profile Survey.

Table 21

MODE OF TRAVEL AND TRIP START TIME
(Total Trips Made in Vehicles Monday through Friday, May 1975)

Trip Start Time	Mode of Travel				Total All Modes
	BART	Automobile Driver ^a	Automobile Passenger	Bus or Streetcar	
Midnight to 6:59 a.m.	31,000 2.7%	691,000 61.2%	202,000 17.9%	205,000 18.2%	1,129,000 100.0%
7:00 a.m. to 8:59 a.m.	159,000 5.4%	1,842,000 62.9%	450,000 15.4%	476,000 16.3%	2,927,000 100.0%
9:00 a.m. to 11:59 a.m.	87,000 2.0%	3,295,000 76.2%	577,000 13.4%	363,000 8.4%	4,322,000 100.0%
Noon to 2:59 p.m.	91,000 1.7%	4,304,000 80.0%	574,000 10.6%	413,000 7.7%	5,382,000 100.0%
3:00 p.m. to 5:59 p.m.	191,000 3.1%	4,092,000 66.2%	998,000 16.1%	904,000 14.6%	6,185,000 100.0%
6:00 p.m. to Midnight	29,000 0.6%	3,489,000 73.7%	949,000 20.0%	268,000 5.7%	4,735,000 100.0%
Number of Trips Represented:	588,000 ^b	17,713,000	3,750,000	2,629,000	24,680,000
Percent of Trips Represented:	2.4%	71.8%	15.2%	10.6%	100.0%
Unweighted Sample Size:	8,142	1,183	262	192	

a. Includes "other" modes, largely pickup trucks and other commercial vehicles.

A total of 834,000 weekday trips per week are made by these modes.

b. Average number of weekday BART trips, May 1975.

Sources: BART Impact Program May 1975 Areawide Travel Survey.

1976 BART Passenger Profile Survey, adjusted to reflect May 1975
BART service hours.

Table 22

TRIP PURPOSE AND TRIP START TIME
(Total Trips Made in Vehicles Monday through Friday, May 1975)

Trip Start Time	Purpose of Travel					Total All Purposes ^b
	To or From Work	Business	School or College	Shopping	Other Purposes ^a	
Midnight to 6:59 a.m.	910,000 72.4%	8,000 0.6%	*	9,000 0.7%	330,000 26.3%	1,257,000 100.0%
7:00 a.m. to 8:59 a.m.	1,876,000 60.5%	114,000 3.7%	729,000 23.5%	111,000 3.6%	270,000 8.7%	3,100,000 100.0%
9:00 a.m. to 11:59 a.m.	690,000 15.4%	583,000 13.0%	462,000 10.3%	1,080,000 24.1%	1,668,000 37.2%	4,483,000 100.0%
Noon to 2:59 p.m.	632,000 12.5%	426,000 8.4%	714,000 14.1%	1,535,000 30.2%	1,767,000 34.8%	5,074,000 100.0%
3:00 p.m. to 5:59 p.m.	2,377,000 37.8%	401,000 6.4%	436,000 7.0%	1,365,000 21.7%	1,702,000 27.1%	6,281,000 100.0%
6:00 p.m. to Midnight	804,000 17.9%	164,000 3.7%	313,000 7.0%	724,000 16.1%	2,480,000 55.3%	4,485,000 100.0%
Number of Trips Represented:	7,289,000	1,696,000	2,654,000	4,824,000	8,217,000	24,680,000
Percent of Trips Represented:	29.5%	6.9%	10.7%	19.6%	33.3%	100.0%
Unweighted Sample Size:	405	142	163	405	616	

Note: Asterisk means negligible.

a. The other-purposes category includes recreation trips, trips to visit friends or relatives, and personal business trips.

b. Due to missing data, the total number of trips for all purposes do not exactly equal the total number for all modes (Table 21) in each category.

Sources: BART Impact Program May 1975 Areawide Travel Survey.
1976 BART Passenger Profile Survey, adjusted to reflect May 1975 BART service hours.

(3.1%) between 3:00 p.m. and 6:00 p.m. As expected, Table 22 shows that these periods are dominated by work-purpose trips. In contrast, BART's smallest share (0.6%) of areawide weekday trips occurs after 6:00 p.m., and its second smallest share is between noon and 3:00 p.m. According to Table 22, shopping and other-purpose trips dominate these two periods.

BART's Share of Weekday Trips as a Function of Distance from BART

The total urbanized area within the BART service area is about 330 square miles, but less than one-third of the urbanized area is within one mile of any of the 33 BART stations operating at the time of the survey.

The areawide survey shows that 29.6% of all weekday trips in the BART service area are made by people who reside within one mile of a BART station. Of the trips made by these residents, 6.0% are on BART. The survey also shows that 12.8% of weekday trips in the service area are made by people who reside within one-half mile of a BART station, and 8.7% of these are made on BART.

Not surprisingly, these figures imply that the closer people live to BART, the more likely they are to use it. But of course, many other variables--some of which may be correlated with distance of residence from BART (e.g., income level)--influence an individual's modal choice.

BART's Share of Weekday Trips According to Time Spent Traveling

Table 23 distributes weekday vehicle trips in the BART service area by mode and the amount of time the trips require. Table 24 provides more detail on travel time by distributing trips according to purpose of travel and travel time.

As trip times increase, so does BART's share of total areawide travel. For trips under 16 minutes, BART carries a negligible 0.2% of trips represented by the survey, but when trip time increases to between 56 and 75 minutes, BART accounts for 13.2% of areawide trips, and climbs to 20.0% for trips taking longer than 75 minutes. (Of course, the total number of these very long trips is small.) Similarly, buses and streetcars tend to have their highest shares for long trips, while automobile's share is highest for short trips.

Although not shown by Table 24, most of the very long trips made on BART are trips to or from work, school, or college.

Table 23

MODE OF TRAVEL AND TIME SPENT TRAVELING
(Total Trips Made in Vehicles Monday through Friday, May 1975)

<u>Time Spent Traveling</u>	<u>Mode of Travel</u>				<u>Total All Modes</u>
	<u>BART</u>	<u>Automobile Driver^a</u>	<u>Automobile Passenger</u>	<u>Bus or Streetcar</u>	
Less than 16 minutes	32,000 0.2%	11,584,000 82.0%	1,826,000 12.9%	694,000 4.9%	14,136,000 100.0%
16 to 35 minutes	178,000 2.3%	4,783,000 62.7%	1,290,000 16.9%	1,377,000 18.1%	7,628,000 100.0%
36 to 55 minutes	166,000 11.2%	602,000 40.6%	435,000 29.4%	279,000 18.8%	1,482,000 100.0%
56 to 75 minutes	144,000 13.2%	567,000 51.8%	113,000 10.3%	271,000 24.7%	1,095,000 100.0%
More than 75 minutes	68,000 20.0%	177,000 52.2%	86,000 25.4%	8,000 2.4%	339,000 100.0%
Number of Trips Represented:	588,000 ^b	17,713,000	3,750,000	2,629,000	24,680,000
Percent of Trips Represented:	2.4%	71.8%	15.2%	10.6%	100.0%
Unweighted Sample Size:	8,142	1,183	262	192	

a. Includes "other" modes, largely pickup trucks and other commercial vehicles. A total of 834,000 weekday trips per week are made by these modes.

b. Average number of weekday BART trips, May 1975.

Sources: BART Impact Program May 1975 Areawide Travel Survey.
1976 BART Passenger Profile Survey, adjusted to reflect May 1975
BART service hours.

Table 24

TRIP PURPOSE AND TIME SPENT TRAVELING
(Total Trips Made in Vehicles Monday through Friday, May 1975)

Time Spent Traveling	Purpose of Travel					Total All Purposes ^b
	To or From Work	Business	School or College	Shopping	Other Purposes ^a	
Less than 16 minutes	3,102,000 22.1%	958,000 6.8%	1,545,000 11.0%	3,585,000 25.6%	4,831,000 34.5%	14,021,000 100.0%
16 to 35 minutes	3,213,000 41.9%	558,000 7.3%	764,000 10.0%	868,000 11.3%	2,260,000 29.5%	7,663,000 100.0%
36 to 55 minutes	622,000 40.1%	51,000 3.3%	207,000 13.4%	217,000 14.0%	452,000 29.2%	1,549,000 100.0%
56 to 75 minutes	316,000 29.0%	129,000 16.8%	138,000 12.6%	82,000 7.5%	427,000 39.1%	1,092,000 100.0%
More than 75 minutes	36,000 10.1%	*	*	72,000 20.3%	247,000 69.6%	355,000 100.0%
Number of Trips Represented:	7,289,000	1,696,000	2,654,000	4,824,000	8,217,000	24,680,000
Percent of Trips Represented:	29.5%	6.9%	10.7%	19.6%	33.3%	100.0%
Unweighted Sample Size: ^c	407	142	163	405	616	

Note: Asterisk means negligible.

- a. The other-purposes category includes recreation trips, trips to visit friends or relatives, and business trips.
- b. Due to missing data, the total number of trips for all purposes may not equal the total number of trips for all modes (Table 23) in each category.
- c. Sample sizes are for the Areawide Travel Survey alone.

Sources: BART Impact Program May 1975 Areawide Travel Survey.
1976 BART Passenger Profile Survey, adjusted to reflect May 1975
BART service hours.

VIII. BART'S SHARE OF WEEKDAY WORK TRIPS

As described in the previous chapter, BART's largest share of total weekday travel is for work purposes. This chapter provides a more detailed description of BART's impacts in this travel market.

BART's Share of Weekday Trips According to Travel Time

Table 25 shows work-trip mode distributed by the time the trip takes. As with trips for all purposes (see Table 23), BART's share of work trips is largest for long trips and smallest for short trips. Of work trips taking 35 minutes or less, BART's share is 2.1%, bus' share is 15.0%, and automobile's share is 82.9%. Of work trips in the 36- to 55-minute range, BART's share is 20.3%, compared to 37.7% made by bus and 42.0% by automobile. Of work trips having a travel time of more than 55 minutes, BART's share rises to 38.3%, with virtually all the very long trips (more than 75 minutes) being made by BART. Of course, as shown in the table, the total number of work trips in the long travel time categories is relatively small.

BART's Share of Weekday Work Trips as a Function of Distance from BART

The May 1975 survey shows that of all trips made to and from work in the BART service area, 36.6% are made by people who live one mile or less from a BART station. Of work trips made by these residents, 10.2% are made by BART. People who live within one-half mile of a BART station account for 16.4% of all work trips in the BART service area. Of work trips made by these people, 15.7% are on BART.

BART's Share of Weekday Work Trips According to the Trip Start Time

Table 26 shows starting times for work trips and how these trips are distributed by mode. As shown, BART captures its largest share of trips during the 7:00 a.m. to 9:00 a.m. morning peak (6.6% of all trips made during the period) and the 3:00 p.m. to 6:00 p.m. afternoon peak (7.1% of the trips). Bus' shares of trips are also highest in the morning and evening peak periods; automobile's share is highest in the off-peak. It is interesting to note how many trips to and from work are made outside the morning and evening peak periods.

BART's Share of Weekday Work Trips According to City of Workplace

Table 27 shows BART's share of work trips made to the cities of San Francisco, Oakland, Berkeley, and others (combined). Over half (51.4%) of all work trips made on BART are to or from workplaces in San Francisco.

Table 25

WORK TRIP MODE AND TIME SPENT TRAVELING
(Total Trips Made in Vehicles Monday through Friday, May 1975)

<u>Time Spent Traveling</u>	<u>Work Trip Mode</u>				<u>Total All Modes</u>
	<u>BART</u>	<u>Automobile Driver^a</u>	<u>Automobile Passenger</u>	<u>Bus or Streetcar</u>	
Less than 16 minutes	16,000 0.5%	2,456,000 78.3%	346,000 11.0%	321,000 10.2%	3,189,000 100.0%
16 to 35 minutes	119,000 3.7%	2,070,000 64.2%	407,000 12.6%	630,000 19.5%	3,226,000 100.0%
36 to 55 minutes	122,000 20.3%	167,000 27.8%	85,000 14.2%	226,000 37.7%	600,000 100.0%
56 to 75 minutes	95,000 32.2%	86,000 29.2%	*	114,000 38.6%	295,000 100.0%
More than 75 minutes	29,000 100.0%	*	*	*	29,000 100.0%
Number of Trips Represented:	381,000	4,779,000	838,000	1,291,000	7,289,000
Percent of Trips Represented:	5.2%	65.6%	11.5%	17.7%	100.0%
Unweighted Sample Size:	4,787	246	22	73	

Note: Asterisk means negligible.

a. Includes "other" modes, largely pickup trucks and other commercial vehicles. A total of 240,000 weekday trips per week are made by these modes.

Sources: BART Impact Program May 1975 Areawide Travel Survey and 1976 BART Passenger Profile Survey.

Table 26

WORK TRIP MODE AND START TIME
(Total Trips Made in Vehicles Monday through Friday, May 1975)

Work Trip Start Time	Work Trip Mode				Total All Modes
	BART	Automobile Driver ^a	Automobile Passenger	Bus or Streetcar	
Midnight to 6:59 a.m.	44,000 4.8%	545,000 59.8%	89,000 9.8%	233,000 25.6%	911,000 100.0%
7:00 a.m. to 8:59 a.m.	124,000 6.6%	1,152,000 61.6%	271,000 14.5%	323,000 17.3%	1,870,000 100.0%
9:00 a.m. to 11:59 a.m.	21,000 3.0%	541,000 77.9%	55,000 7.9%	78,000 11.2%	695,000 100.0%
Noon to 2:59 a.m.	14,000 2.2%	530,000 83.3%	31,000 4.9%	61,000 9.6%	636,000 100.0%
3:00 p.m. to 5:59 p.m.	168,000 7.1%	1,294,000 54.7%	367,000 15.5%	536,000 22.7%	2,365,000 100.0%
6:00 p.m. to Midnight	10,000 1.2%	717,000 88.3%	25,000 3.1%	60,000 7.4%	812,000 100.0%
Number of Trips Represented:	381,000	4,779,000	838,000	1,291,000	7,289,000
Percent of Trips Represented:	5.2%	65.6%	11.5%	17.7%	100.0%
Unweighted Sample Size:	4,787	246	22	73	

a. Includes "other" modes, largely pickup trucks and other commercial vehicles. A total of 240,000 weekday trips per week are made in these modes.

Sources: BART Impact Program May 1975 Areawide Travel Survey.
1976 BART Passenger Profile Survey.

Table 27

WORK TRIP MODE AND LOCATION OF WORKPLACE
(Total Trips Made in Vehicles Monday through Friday, May 1975)

<u>Location of Workplace</u>	<u>Work Trip Mode</u>				<u>Total All Modes</u>
	<u>BART</u>	<u>Automobile Driver^a</u>	<u>Automobile Passenger</u>	<u>Bus or Streetcar</u>	
Berkeley	52,000 7.4%	534,000 75.4%	73,000 10.3%	49,000 6.9%	708,000 100.0%
Oakland	67,000 5.8%	795,000 68.4%	138,000 11.9%	162,000 14.9%	1,162,000 100.0%
San Francisco	196,000 6.9%	1,315,000 46.1%	544,000 19.1%	795,000 27.9%	2,850,000 100.0%
Other	66,000 2.6%	2,135,000 83.1%	83,000 3.2%	285,000 11.1%	2,569,000 100.0%
Number of Trips Represented:	381,000	4,779,000	838,000	1,291,000	7,289,000
Percent of Trips Represented:	5.2%	65.6%	11.5%	17.7%	100.0%
Unweighted Sample Size:	4,787	246	22	73	

a. Includes "other" modes, largely pickup trucks and other commercial vehicles.
A total of 240,000 weekday trips are made by these modes.

Sources: May 1975 Areawide Travel Survey.
1976 BART Passenger Profile Survey.

These BART trips represent a 6.9% share of all San Francisco work trips. The 67,000 daily work trips made to Oakland by BART represent 17.6% of all BART work trips and a 5.8% share of all work trips made to or from workplaces in Oakland. The 52,000 daily work trips to Berkeley by BART represent 13.6% of all BART work trips and a 7.4% share of all trips to or from Berkeley workplaces.

IX. POTENTIAL BART TRIPS

The previous two chapters consider BART's share of various "trip markets" defined by the number of trips made throughout the May 1975 areawide survey sampling area. However, this "service area" includes many parts of the Bay Area to which BART effectively provides very little service. Thus, the numbers given understate BART's share of trips it could reasonably serve. This chapter considers BART's share of those areawide trips which potentially could have used BART at the time of the survey.

To define "potential" BART trips, the May 1975 survey asked respondents to describe all their vehicle trips on the day before the survey. For each trip not made on BART, the survey simply asked, "Could you have taken BART?" (yes or no). If the respondent answered "yes," the trip is counted as a potential BART trip.

According to the survey results, 2.4% of the 24,680,000 trips made on weekdays (588,000) are made on BART and 8.8% of all weekday trips (2,176,000) can be made on BART but are not. Therefore, 11.2% or 2,764,000 trips in total are or can be made by BART on weekdays. Taking this total as BART's maximum weekday travel market, BART realized 21.3% of its maximum travel market in May 1975.

The total potential travel market is defined here by travelers' perceptions of the feasibility of using BART for particular trips. These perceptions probably vary greatly among travelers, so that the resulting definition of the travel market is largely arbitrary. Accordingly, the estimate of potential market share should be viewed only as a general indicator of BART's share of travel. Nevertheless, it is interesting to compare the 21.3% estimate with the 2.4% estimate given in Table 20.

Potential BART trips for the evening travel market (8:00 p.m. to midnight) and the weekend travel market are excluded from the above estimates. To estimate the likelihood of people using BART during evenings and weekends, the May 1975 areawide survey asked respondents who use BART or have tried BART (57.2% of all respondents), "Would you use BART more regularly if it operated during the evenings?" and "Would you use BART on a regular basis if it operated on weekends?" The survey results show that 49.1% answered "yes" about evening service, and 67.2% answered "yes" about weekend service.

X. ATTITUDES TOWARD BART

The May 1975 survey asked travelers to rate their satisfaction with and perceptions of certain BART service characteristics. Specifically, the survey asked about satisfaction with trip cost, station parking space availability, safety, and security;* and about their perceptions of the level of rush-hour crowding and reliability.** This chapter presents the resultant ratings by trip purpose and mode. It also summarizes the reasons why some travelers have reduced their use of BART.

BART Satisfaction and Perceptions Stratified by Trip Purpose and Mode

Table 28 summarizes average satisfaction ratings for cost, parking availability, safety, and security as given by (1) respondents making work trips,*** (2) respondents making trips for nonwork purposes,*** (3) BART riders, (4) bus and streetcar riders, (5) automobile drivers, and (6) automobile passengers. Table 29 summarizes average perception ratings of BART's crowding and reliability stratified by the same six groups of travelers.

Comparing the average ratings between the work and nonwork travelers, work travelers are slightly more satisfied with BART's cost than nonwork travelers. However, both work and nonwork travelers are mostly satisfied with BART's total travel cost, safety, and security. With regard to parking space availability, both groups of respondents are split about evenly between those who are satisfied and those who are dissatisfied.

As shown in Table 29, both groups also give similar average perception ratings, ranking BART as very crowded to crowded and as reliable to very reliable. In light of BART's widely held reputation for unreliability, the latter result is surprising and may be explained by the fact that the questionnaire wording (especially when read over the telephone) may have put relatively little emphasis on the "on time" part of the question "How reliable do you think BART is to get you where you are going on time?"

*In the survey questionnaire, these characteristics were defined as "Total cost of BART trip," "Ability to find a place to park at the BART station," "Safety from accident or injury on BART," and "Security from crime and unpleasant behavior of other people on BART."

**In the questionnaire, the questions were: "How crowded do you think the BART trains are during the rush hour?" and "How reliable do you think BART is to get you where you are going on time?"

***The ratings of respondents making trips for both work and nonwork purposes on the survey day are excluded from the average.

Table 28

SATISFACTION WITH BART COST, PARKING AVAILABILITY, SAFETY, AND SECURITY

<u>Traveler Group</u>	<u>Average Satisfaction Ratings^a</u>				<u>Unweighted Sample Size</u>
	<u>Total Travel Cost</u>	<u>Station Parking Availability</u>	<u>Safety from Injury</u>	<u>Security from Crime</u>	
Work Tripmakers	2.6	2.0	2.5	2.7	83
Nonwork Tripmakers	2.4	2.1	2.5	2.6	279
BART Riders	2.6	2.1	2.6	2.7	25
Bus and Streetcar Riders	2.5	2.0	2.6	2.6	69
Automobile Drivers	2.4	2.2	2.5	2.6	292
Automobile Passengers	2.4	1.9	2.5	2.6	60

a. Based on a rating scale of: 1 = very dissatisfied.
 2 = neutral.
 3 = very satisfied.

Source: May 1975 Areawide Travel Survey.

Table 29

PERCEPTIONS OF BART CROWDING AND RELIABILITY

<u>Traveler Group</u>	<u>Average Perception Rating^a</u>		<u>Unweighted Sample Size</u>
	<u>Rush-Hour Crowding</u>	<u>On-Time Reliability</u>	
Work Tripmakers	1.6	3.3	88
Nonwork Tripmakers	1.7	3.3	274
BART Riders	1.4	3.6	26
Bus and Streetcar Riders	1.7	3.3	81
Automobile Drivers	1.6	3.1	279
Automobile Passengers	1.8	3.5	55

a. Based on a rating scale of: 1 = very crowded (very unreliable).
 2 = crowded (unreliable).
 3 = uncrowded (reliable).
 4 = very uncrowded (very reliable).

Source: May 1975 Areawide Travel Survey.

The satisfaction ratings of Table 28 show very little difference in average ratings among the four modes, with BART riders being, if anything, slightly more satisfied with cost, safety, and security, and slightly less satisfied with station parking space availability.

The perception ratings of Table 29 suggest that BART riders perceive BART to be more crowded in rush hours than do nonusers, but also perceive BART as more reliable. However, the small sample sizes involved permit little confidence in these results.

Reasons for Reduced Use of BART

According to the May 1975 survey, 62% of the travelers making weekday trips in the BART service area have tried BART at least once since it opened. However, only 17% of travelers who have tried BART continue to use it for three or more trips per week.

The following BART-service related factors were mentioned by respondents to the survey as the reasons why BART is not used as often as before: "BART stations are too far from home" (mentioned by 16% of the respondents); "BART costs too much" (6%); "BART is unreliable" (4%); "BART trip takes too long" (3%); "BART is inconvenient" (3%); "BART is unsafe" (2%); "BART is too crowded" (1%); "BART stations don't have enough parking spaces" (1%). Again, small sample sizes do not allow much confidence to be placed in these results, but they suggest that access-related problems are the principal cause of reduced BART use.

Comparison of Attitudes Towards BART: 1971, 1973, and 1975

This section compares attitudes towards BART as revealed in the May 1975 survey with those given in a report on the results of the 1971 and 1973 Attitude and Awareness Surveys (described in Chapter II).

The October 1971 Attitude and Awareness Survey, the May 1973 Attitude and Awareness Survey, and the May 1975 Areawide Travel Survey were conducted during periods corresponding to pre-BART service, initial (Fremont and Richmond Line) service, and full weekday service levels respectively. Table 30 compares respondents' attitudes toward BART for the three periods by showing the distribution of positive, neutral, and negative attitudes.

According to the table, the percentage of people viewing BART positively has increased from 41% to 56% over the four years and the percentage of those with neutral or negative attitudes has decreased correspondingly. Slightly different methods of computing the attitude percentages for the surveys make the comparison tenuous, but the results suggest that the reality of BART is viewed favorably relative to people's preconceptions.

Table 30

COMPARISON OF ATTITUDES TOWARD BART

<u>Attitude</u>	<u>1971 October^a</u>	<u>1975 May^a</u>	<u>1975 May^b</u>
Positive	41%	46%	56%
Neutral	38	36	31
Negative	<u>21</u>	<u>18</u>	<u>13</u>
	100%	100%	100%
Unweighted Sample Size:	873	864	787
Percent of Unweighted Sample Responding:	97%	96%	79%

-
- a. Source: "Attitude and Awareness Study, A comparative Analysis of Phases I and II", BART Office of Research, October 1973. Attitudes toward BART are estimated by classifying responses to an open-ended question about BART into three categories: positive, neutral, and negative.
- b. Source: May 1975 Areawide Travel Survey (weighted). Attitudes toward BART were approximated using the satisfaction ratings for total trip cost, station parking, safety from accidents, and security from crime.

APPENDIX A: DEVELOPMENT OF WEIGHTING FACTORS FOR ANALYSIS OF 1976 BART PASSENGER PROFILE SURVEY

The weighting factors described here are designed to compensate for sampling and nonresponse errors introduced by:

- Variations in the proportion of travelers who were handed questionnaires at different stations and at different times of the day (differential sampling rates).
- Variations in the questionnaires returned as a function of travelers' ethnic backgrounds and time periods of travel (differential response rates).

The weighting scheme comprises two sets of weighting factors, the first to compensate for the variation in sampling rates, and the second for variation in response rates. Thus, before analysis of the data, each respondent was weighted by the product of two factors: a sampling rate factor and an ethnic response rate factor.

Sampling Rate Factors

The Metropolitan Transportation Commission (MTC) developed the factors used to compensate for the variation in sampling rates. These are documented elsewhere.* Factors were calculated for each station by dividing the number of people who entered the station by the number of people who received questionnaires for each of the following time periods:

<u>Daytime Period</u>	<u>Time of Questionnaire Handout</u>
1	6:00 a.m. to 7:29 a.m.
2	7:30 a.m. to 8:14 a.m.
3	8:15 a.m. to 8:59 a.m.
4	9:00 a.m. to 11:59 a.m.
5	12:00 p.m. to 3:00 p.m.

*1976 BART Passenger Profile Survey: Field Methods and Processing Procedures," MTC, September 1976.

Ethnic Response Rate Factors

The Transportation System and Travel Behavior (TSTB) Project team developed weighting factors to compensate for variations in response rates for six ethnic categories (Asian, Black, Spanish-American, White, Other, and "no identification given") and two time periods (morning peak, 6:00 a.m. to 8:59 a.m., and off-peak, 9:00 a.m. to 3:00 p.m.). Variations in response rates by ethnic category within these two periods are not large enough to warrant a finer breakdown by time period.

The following paragraphs describe the steps taken by the TSTB Project team to calculate the ethnic response rate compensation weighting factors for each of the two time periods. Table A-1 documents the steps described below for the morning peak period.

Step 1: Estimate Questionnaires Handed Out to Each Ethnic Category.

This step attempts to determine the total number of questionnaires handed out to each ethnic group (for all 33 stations combined). On their tally sheets, interviewers recorded the "visual" ethnic identity of each questionnaire recipient, but in a number of cases, the ethnic identity recorded differed from that given by the recipient/respondent in the returned questionnaire. Using the following procedure, the team adjusted the tally sheet totals to reflect these differences.

The team compared the tally sheet record of ethnic category with the respondent's response to the ethnic self-identification question. Then the information was aggregated for the returned questionnaires to determine the percentage of time the survey interviewers were incorrect in recording the respondent's ethnic category and to which category the respondent was incorrectly assigned. For example: 2.136% of the respondents recorded by interviewers as Asian, Black, Spanish-American or Other are actually White according to returned questionnaires. Of the 2.136%, 0.379% were incorrectly reported as Asian, 0.396% as Black, 0.982% as Spanish-American, and 0.379% as Other. Since the tally sheets indicate that 4,050 questionnaires were distributed to Whites during the morning peak period, the procedure required adding 86 ($=4,050 \times 2.136\%$) to the total for Whites and subtracting: 15 ($=4,050 \times 0.379\%$) from the tally total for Asians; 16 ($=4,050 \times 0.396\%$) from the tally total for Blacks; 40 ($=4,050 \times 0.982\%$) from the tally total for Spanish-Americans; and 15 ($=4,050 \times 0.379\%$) from the tally total for Others.

The team performed this procedure for the five ethnic categories. The net result for the morning peak period is the second line under Step 1 in Table A-1.

Step 2: Estimate Questionnaires Returned by Ethnic Category. The team recorded the number of questionnaires returned according to the ethnic category listed on the questionnaire. Respondents who did not designate their ethnic category were allocated according to the same ethnic distribution as those who did respond.

Table A-1

CALCULATION OF RESPONSE RATE WEIGHTS
[Time Period: Morning Peak (6:00 a.m. to 8:59 a.m.)]

Step 1: Estimate Questionnaires Handed Out

	<u>Asian</u>	<u>Black</u>	<u>Spanish-American</u>	<u>White</u>	<u>Other</u>	<u>Total</u>
As Recorded on Tally Sheets	391	689	251	4,050	81	5,462
Adjustment	<u>+ 77</u>	<u>- 2</u>	<u>+ 56</u>	<u>- 137</u>	<u>+ 6</u>	<u>+ 0</u>
Adjusted Total	468	687	307	3,913	87	5,462
Percent	8.6%	12.6%	5.6%	71.7%	1.5%	100.0%

Step 2: Estimate Questionnaires Returned

	<u>Asian</u>	<u>Black</u>	<u>Spanish-American</u>	<u>White</u>	<u>Other</u>	<u>Total</u>
As Recorded on Questionnaires	330	385	200	3,062	51	4,028
Allocation of Nonresponses	<u>+ 23</u>	<u>+ 34</u>	<u>+ 15</u>	<u>+ 194</u>	<u>+ 4</u>	<u>+ 270</u>
Adjusted Total	353	419	215	3,256	55	4,298
Percent	8.2%	9.7%	5.0%	75.8%	1.3%	100.0%

Step 3: Derive Weights

<u>Asian</u>	<u>Black</u>	<u>Spanish-American</u>	<u>White</u>	<u>Other</u>
$468 \div 353$ = 1.326	$687 \div 419$ = 1.640	$307 \div 215$ = 1.428	$3,913 \div 3,256$ = 1.202	$5,462 \div 4,298$ = 1.582

Step 4: Derive Weight for Nonrespondents

$$(0.086)(1.326) + 0.126(1.640) + (0.056)(215) + \\ (0.717)(1.202) + (0.015)(1.528) = 1.286$$

Step 3: Calculate Weights by Ethnic Category. The team calculated the weights by dividing the adjusted totals from step 1 by the adjusted totals from step 2 for each ethnic group.

Step 4: Calculate Weight for Nonrespondents. Respondents who did not list an ethnic category on their questionnaires were assigned a weighting factor calculated as the weighted average of the five ethnic category weights.

Table A-2 gives the ethnic response rate weighting factors for peak and off-peak periods.

Table A-2

SUMMARY OF ETHNIC RESPONSE RATE WEIGHTS

Respondent's Ethnic Identification	Time of Questionnaire Handout	
	Morning Peak Period (6:00 a.m. to 8:59 a.m.)	Off-Peak Period (9:00 a.m. to 3:00 p.m.)
Asian	1.326	1.433
Black	1.640	1.814
Spanish-American	1.428	1.414
White	1.202	1.371
Other	1.582	2.271
No identification given	1.286	1.453

APPENDIX B: PEAK AND OFF-PEAK WEIGHTING FACTORS
FOR 1976 BART PASSENGER PROFILE ANALYSIS

Data from BART's Data Acquisition System (DAS) for October 21, 1976, show the following distribution of ridership on the System by time period:

<u>Time of Entry</u>	<u>Number of BART Trips</u>			
	<u>East Bay</u>	<u>West Bay</u>	<u>Transbay</u>	<u>Total</u>
6:00 a.m. to 9:00 a.m.	11,579	10,502	15,038	37,119
9:00 a.m. to 3:00 p.m.	11,330	8,422	12,587	32,339
3:00 p.m. to 7:00 p.m.	16,264	14,383	20,671	51,318
7:00 p.m. to midnight	<u>3,269</u>	<u>2,005</u>	<u>4,804</u>	<u>10,078</u>
Total	42,442	35,312	53,100	130,854

The following ratios can be computed:

$$\frac{\text{Morning peak-period ridership (6:00 a.m. to 9:00 a.m.)}}{\text{Total peak-period ridership (6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 7:00 p.m.)}}$$

$$\frac{\text{Midday off-peak ridership (9:00 a.m. to 3:00 p.m.)}}{\text{Total off-peak ridership (9:00 a.m. to 3:00 p.m. and 7:00 p.m. to midnight)}}$$

These ratios are:

	<u>East Bay</u>	<u>West Bay</u>	<u>Transbay</u>	<u>Total</u>
<u>Morning Peak</u> Total Peak	2.4046	2.3695	2.3746	2.3825
<u>Midday Off-peak</u> Total Off-peak	1.2885	1.2381	1.3817	1.3116

These ratios are used as weighting factors to estimate the characteristics of all-day BART ridership from tabulating of 1976 BART Passenger Profile Survey data for the morning peak (6:00 a.m. - 9:00 a.m.) and midday off-peak (9:00 a.m. to 3:00 p.m.) periods.

APPENDIX C: ESTIMATION OF 1975 INCOME DISTRIBUTION

Income distributions for the BART service area counties for 1975 (given in Table 2, Chapter III) were estimated from the 1969 BART service area distributions given in the U.S. Census by using a set of transition factors. For the U.S. as a whole, 1969 and 1975 family incomes were distributed as follows:

Annual Family Income for Total U.S.			
	<u>Income Range</u>	<u>1969</u>	<u>1975</u>
1.	Under \$5,000	20.0%	12.1%
2.	\$5,000 to \$6,999	12.3	8.2
3.	\$7,000 to \$9,999	21.7	12.8
4.	\$10,000 to \$14,999	26.7	22.4
5.	\$15,000 to \$24,999	15.6	30.4
6.	\$25,000 and over	<u>3.7</u>	<u>14.1</u>
		100.0%	100.0%

Source: Bureau of Census, Table 4 of "Money, Income, and Poverty Status of Families and Persons in the United States: 1975 and 1974 Revisions (Advance Report)," Consumer Income, Current Population Reports, Series P-60, No. 103, September 1976.

These two income distributions can be related as follows:

1975 Income Range 1 = 0.605 (1969 Income Range 1)

1975 Income Range 2 = 0.395 (1969 Income Range 1) + 0.024 (1969 Income Range 2)

1975 Income Range 3 = 0.976 (1969 Income Range 2) + 0.037 (1969 Income Range 3)

1975 Income Range 4 = 0.963 (1969 Income Range 3) + 0.056 (1969 Income Range 4)

1975 Income Range 5 = 0.944 (1969 Income Range 4) + 0.333 (1969 Income Range 5)

1975 Income Range 6 = 0.667 (1976 Income Range 5) + 1.000 (1969 Income Range 6)

The same set of transition factors were applied to the 1969 income distributions for each of the Bay Area counties to give the 1975 income distributions shown in Table 2.

APPENDIX D: APPLICATION OF TWO-WAY CONTINGENCY TESTS

Table D-1 shows the calculated estimates of confidence bounds for use in two-way contingency tests of percentages given in many of the tables of this report. The estimates were developed using a likelihood ratio test of independence of the sample percentages with respect to the stratification being analyzed. The test statistic used to estimate the confidence interval is distributed approximately as chi-square, which is an asymmetric distribution. The confidence interval is consequently not exactly symmetric about the estimated percentage. However, in constructing the table, symmetry is assumed, and the "confidence bound" is calculated as half the interval between the confidence limits. The slight error thereby introduced is largest for the 5% or 95% estimates and smallest for the 50% estimates.

Example of a Two-Way Contingency Test

According to Table 4 (Chapter IV), 71.7% of the people riding BART during the morning peak are white and 28.3% are nonwhite. During the off-peak period, 73.5% of the people are white, and 26.5% are nonwhite. A two-way contingency test can be used to determine if significantly more whites are riding BART during the off-peak period than during the peak. Since the percentage of whites is approximately 70% and since the sample sizes are approximately 4,000 for the morning peak (Sample 1) and 4,000 for the off-peak (Sample 2), the confidence bound 2.1, from Table D-1, is used in the contingency test. The estimated percentage from Sample 2 ($P_2 = 73.5\%$) is within plus or minus 2.1% of the estimated percentage from Sample 1 ($P_1 = 71.7\%$); therefore, statistically, the difference between the two observed percentages is not significant at the 95% confidence level.

Table D-1

CONFIDENCE BOUNDS FOR TWO-WAY CONTINGENCY TESTS^a
 (Percentages Shown are \pm at the 95% Confidence Level)

Magnitude of Estimated Percentage	Size of Sample 1 (n ₁)/Size of Sample 2 (n ₂)									
	100/100	600/300	700/600	1000/1000	2000/1000	3000/1000	2000/2000	3000/3000	5000/3000	4000/4000
5% or 95%	6.1	3.0	2.4	1.9	1.6	1.4	1.3	1.1	1.0	1.0
10% or 90%	8.0	4.2	3.3	2.7	2.3	2.1	1.9	1.5	1.4	1.4
20% or 80%	10.8	5.5	4.2	3.5	2.9	2.7	2.4	2.0	1.8	1.8
30% or 70%	12.6	6.2	4.8	4.1	3.5	3.3	2.9	2.3	2.1	2.1
40% or 60%	13.3	6.7	5.2	4.3	3.7	3.5	3.1	2.5	2.2	2.2
50% or 50%	13.9	6.8	5.3	4.4	3.7	3.5	3.1	2.5	2.2	2.2

-
- a. The confidence bounds were constructed using a likelihood ratio test of independence of the sample percentages with respect to the stratification being analyzed for a two-by-two contingency table with P_1 , P_2 , $(1-P_1)$, and $(1-P_2)$ as the four proportions. The null hypothesis is $P_1 = P_2$ and the alternative is $P_1 \neq P_2$.

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